



# LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

L.B. Reddy Nagar :: Mylavaram-521 230 :: NTR Dist. :: A.P.  
Approved by AICTE, New Delhi. Affiliated to JNTUK, Kakinada

## B.Tech. (IV Semester) (R23) Semester End Examinations (Regular & Supplementary) May 2026

### TIME TABLE

**R23**

Time : 10.00 AM to 01.00 PM

A.Y. : 2025-26

| Branch      | 01-05-2026<br>(Friday)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 04-05-2026<br>(Monday)                             | 06-05-2026<br>(Wednesday)                            | 08-05-2026<br>(Friday)                              | 11-05-2026<br>(Monday)                      | 13-05-2026<br>(Wednesday)                    |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------|-----------------------------------------------------|---------------------------------------------|----------------------------------------------|
| AI & DS     | <b>Minor Program</b><br>23ADM1 - Introduction to Artificial Intelligence and Data Science (ASE, CE, ECE, EEE & ME)<br><br>23AMM1 - Principles of Artificial Intelligence (ASE, ECE & EEE)<br><br>23MEM1 - Mechanics of Materials (ECE & CSE (AI & ML))<br><br>23QT01 - Survey of Quantum Technologies and Applications (ASE, CSE, CSE (AI & ML), EEE, & ME)<br><br>23QT02 - Foundations of Quantum Technologies (AI & DS, CSE (AI & ML), ECE & EEE)<br><br><b>Honors Program</b><br>23CSH1 - Mathematical Foundations for Security (CSE)<br><br>23ECH4 - Real Time Operating Systems (ECE) | 23HS02-Managerial Economics and Financial Analysis | 23AD01-Statistical Methods for Data Science          | 23AD02-Artificial Intelligence                      | 23AD03-Introduction to Data Science         | 23IT01-Digital Logic & Computer Organization |
| ASE         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS03-Industrial Management                       | 23FE13-Complex Variables, Probability and Statistics | 23AE04-Materials and Manufacturing Technology       | 23AE05-Solid Mechanics                      | 23AE06-Aerodynamics                          |
| CE          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS02-Managerial Economics and Financial Analysis | 23CE04-Engineering Geology                           | 23CE05-Concrete Technology                          | 23CE06-Structural Analysis                  | 23CE07-Hydraulics & Hydraulic Machinery      |
| CSE         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS02-Managerial Economics and Financial Analysis | 23FE10-Probability & Statistics                      | 23CS06-Operating Systems                            | 23CS03-Database Management Systems          | 23IT02-Software Engineering                  |
| CSE (AI&ML) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23ME09-Optimization Techniques                     | 23FE10-Probability & Statistics                      | 23AM01-Machine Learning                             | 23CS03-Database Management Systems          | 23IT01-Digital Logic & Computer Organization |
| ECE         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS02-Managerial Economics and Financial Analysis | 23EE09-Control Systems                               | 23EC05-Electromagnetic Waves and Transmission Lines | 23EC06-Electronic Circuit Analysis          | 23EC07-Analog Communications                 |
| EEE         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS02-Managerial Economics & Financial Analysis   | 23EE09-Control Systems                               | 23EE06-Analog Circuits                              | 23EE07-Power Systems-I                      | 23EE08-Induction and Synchronous Machines    |
| IT          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23ME09-Optimization Techniques                     | 23FE10-Probability & Statistics                      | 23CS06-Operating Systems                            | 23CS03-Database Management Systems          | 23IT02-Software Engineering                  |
| ME          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 23HS03-Industrial Management                       | 23FE13-Complex Variables, Probability and Statistics | 23ME06-Manufacturing Processes                      | 23ME07-Fluid Mechanics & Hydraulic Machines | 23ME08-Theory of Machines                    |

Note(s): Any omissions or clashes in the time table may please be informed to the Controller of Examinations immediately.

Date: **11 APR 2026**

**CONTROLLER OF EXAMINATIONS**

**PRINCIPAL**

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23ADM1-INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

(ASE,CE,ECE,EEE&amp;ME)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                                                                                                                                            | Marks | CO  | BL |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Define state of the art.                                                                                                                                                                                                                                                                                                       | 2M    | CO1 | L1 |
| (b)   | Describe environment in AI.                                                                                                                                                                                                                                                                                                    | 2M    | CO1 | L1 |
| (c)   | Explain BFS.                                                                                                                                                                                                                                                                                                                   | 2M    | CO2 | L2 |
| (d)   | Define heuristic.                                                                                                                                                                                                                                                                                                              | 2M    | CO2 | L2 |
| (e)   | Explain ontological engineering.                                                                                                                                                                                                                                                                                               | 2M    | CO3 | L2 |
| (f)   | Write about categories.                                                                                                                                                                                                                                                                                                        | 2M    | CO3 | L2 |
| (g)   | Define EDA.                                                                                                                                                                                                                                                                                                                    | 2M    | CO4 | L1 |
| (h)   | What is datafication?                                                                                                                                                                                                                                                                                                          | 2M    | CO4 | L1 |
| (i)   | What is reindexing?                                                                                                                                                                                                                                                                                                            | 2M    | CO5 | L1 |
| (j)   | Define pandas ranking.                                                                                                                                                                                                                                                                                                         | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                                                                                                                                | Marks | CO  | BL |
| 2(a)  | Explain the concept of rational agents.                                                                                                                                                                                                                                                                                        | 5M    | CO1 | L2 |
| (b)   | Explain agents & environments.                                                                                                                                                                                                                                                                                                 | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                |       |     |    |
| 3(a)  | Given two scenarios (weather forecast system & medical diagnosis system), compare their environments.                                                                                                                                                                                                                          | 5M    | CO1 | L3 |
| (b)   | Consider a <b>vacuum cleaner agent</b> working in a 2-room environment (Room A and Room B). <ul style="list-style-type: none"> <li>The agent can move left or right and clean if the room is dirty.</li> <li>If both rooms are clean, it should stop.</li> </ul> <b>Tasks:</b> Represent the environment as a PEAS description | 5M    | CO1 | L3 |
| 4(a)  | Write short notes on mental objects.                                                                                                                                                                                                                                                                                           | 5M    | CO2 | L2 |
| (b)   | Explain UCS.                                                                                                                                                                                                                                                                                                                   | 5M    | CO2 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                |       |     |    |
| 5(a)  | Write about local search algorithms.                                                                                                                                                                                                                                                                                           | 5M    | CO2 | L2 |
| (b)   | Consider the 8-puzzle problem. Explain how heuristic evaluation can reduce search effort.                                                                                                                                                                                                                                      | 5M    | CO2 | L3 |
| 6(a)  | Explain propositional logic with application.                                                                                                                                                                                                                                                                                  | 5M    | CO3 | L2 |
| (b)   | Write short notes on categories.                                                                                                                                                                                                                                                                                               | 5M    | CO3 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                |       |     |    |
| 7(a)  | Construct a reasoning system for categories using "Birds fly, Penguins are birds, Penguins don't fly." Resolve the conflict.                                                                                                                                                                                                   | 5M    | CO3 | L3 |
| (b)   | Write about KB.                                                                                                                                                                                                                                                                                                                | 5M    | CO3 | L2 |
| 8(a)  | Explain role of data scientist.                                                                                                                                                                                                                                                                                                | 5M    | CO4 | L2 |
| (b)   | Discuss the fancy indexing in NumPy.                                                                                                                                                                                                                                                                                           | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                |       |     |    |
| 9.    | Create a 3×3 NumPy array and demonstrate fancy indexing to extract diagonal elements.                                                                                                                                                                                                                                          | 10M   | CO4 | L3 |
| 10(a) | Explain descriptive statistics in pandas.                                                                                                                                                                                                                                                                                      | 5M    | CO5 | L2 |
| (b)   | Write about essential functionalities of pandas.                                                                                                                                                                                                                                                                               | 5M    | CO5 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                |       |     |    |
| 11.   | Explain in detail about pandas DataFrame. Discuss its structure, features, and different ways of creating a DataFrame with suitable examples.                                                                                                                                                                                  | 10M   | CO5 | L2 |

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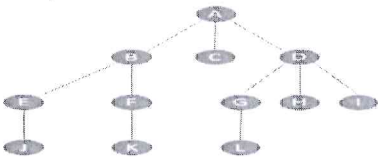
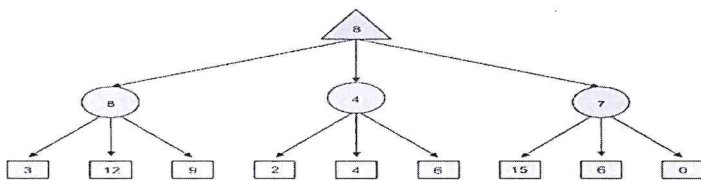
B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AMM1-PRINCIPLES OF ARTIFICIAL INTELLIGENCE**

(ASE, ECE &amp; EEE)

Time : 3 hours

Max. Marks: 70

| Q.No                                                                                                                  | Compulsory Question                                                                                         | Marks | CO  | BL |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)                                                                                                                  | What are the foundational fields contributing to AI?                                                        | 2 M   | CO1 | L1 |
| (b)                                                                                                                   | Explain the concept of a vacuum-cleaner agent using PEAS.                                                   | 2 M   | CO1 | L2 |
| (c)                                                                                                                   | What is the time complexity of the Breadth-First Search (BFS) algorithm?                                    | 2 M   | CO2 | L1 |
| (d)                                                                                                                   | Explain what a problem-solving agent does.                                                                  | 2 M   | CO2 | L2 |
| (e)                                                                                                                   | What is an evaluation function in game playing?                                                             | 2 M   | CO3 | L2 |
| (f)                                                                                                                   | Explain the concept of a game tree.                                                                         | 2 M   | CO3 | L2 |
| (g)                                                                                                                   | What are the key components of a knowledge-based agent?                                                     | 2 M   | CO4 | L2 |
| (h)                                                                                                                   | Differentiate between forward chaining and backward chaining.                                               | 2 M   | CO4 | L2 |
| (i)                                                                                                                   | What role do knowledge engineers play in expert system development?                                         | 2 M   | CO5 | L2 |
| (j)                                                                                                                   | Describe the function of meta-knowledge in expert systems.                                                  | 2 M   | CO5 | L2 |
| Q.No                                                                                                                  | All questions carry equal marks                                                                             | Marks | CO  | BL |
| 2(a)                                                                                                                  | Define Artificial Intelligence and explain its foundations in Philosophy and Mathematics.                   | 5 M   | CO1 | L2 |
| (b)                                                                                                                   | Illustrate the concept of PEAS (Performance, Environment, Actuators, Sensors) for an Automated Taxi Driver. | 5 M   | CO1 | L3 |
| (OR)                                                                                                                  |                                                                                                             |       |     |    |
| 3(a)                                                                                                                  | Describe the structure of an Intelligent Agent with a neat block diagram.                                   | 5 M   | CO1 | L2 |
| (b)                                                                                                                   | Differentiate between Simple Reflex Agents and Model-based Reflex Agents with diagrams.                     | 5 M   | CO1 | L2 |
| 4(a)                                                                                                                  | Explain the four main components required to formally define a "Problem" in AI.                             | 5 M   | CO2 | L2 |
| (b)                                                                                                                   | Differentiate between Uninformed (Blind) Search and Informed (Heuristic) Search.                            | 5 M   | CO2 | L2 |
| (OR)                                                                                                                  |                                                                                                             |       |     |    |
| 5(a)                                                                                                                  | Discuss the working of Depth-First Search (DFS) and its advantages over BFS.                                | 5 M   | CO2 | L2 |
| (b)                                                                                                                   | Apply the Breadth-First Search (BFS) algorithm to a simple tree and state its space complexity.             | 5 M   | CO2 | L3 |
|  <p>Breadth First Search (BFS)</p> |                                                                                                             |       |     |    |
| 6(a)                                                                                                                  | Define Adversarial Search and explain how it differs from standard state-space search.                      | 5 M   | CO3 | L2 |
| (b)                                                                                                                   | Explain Bayes' Theorem and its significance in handling uncertain knowledge.                                | 5 M   | CO3 | L2 |
| (OR)                                                                                                                  |                                                                                                             |       |     |    |
| 7(a)                                                                                                                  | Describe the Min-Max algorithm for a two-player Tic-Tac-Toe game.                                           | 5 M   | CO3 | L2 |
| (b)                                                                                                                   | Apply the Alpha-Beta Pruning technique to a sample game tree to identify pruned branches.                   | 5 M   | CO3 | L3 |
|                                   |                                                                                                             |       |     |    |
| 8(a)                                                                                                                  | Explain the structure and components of a Knowledge-Based System.                                           | 5 M   | CO4 | L2 |
| (b)                                                                                                                   | What is first order logic? Discuss the different elements used in first order logic.                        | 5 M   | CO4 | L2 |
| (OR)                                                                                                                  |                                                                                                             |       |     |    |
| 9.                                                                                                                    | Describe the "Wumpus World" environment as a testbed for logic-based agents.                                | 10 M  | CO4 | L2 |
| 10(a)                                                                                                                 | Define an Expert System and explain its primary characteristics.                                            | 5 M   | CO5 | L2 |
| (b)                                                                                                                   | Describe the architecture of an Expert System with a neat diagram.                                          | 5 M   | CO5 | L2 |
| (OR)                                                                                                                  |                                                                                                             |       |     |    |
| 11(a)                                                                                                                 | Explain the "Knowledge Acquisition" process and its various methods.                                        | 5 M   | CO5 | L2 |
| (b)                                                                                                                   | Describe the working and application of the MYCIN expert system.                                            | 5 M   | CO5 | L2 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23MEM1-MECHANICS OF MATERIALS**

(ECE&amp;CSE(AI&amp;ML))

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                                                     | Marks | CO  | BL |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Define force.                                                                                                                                                                                                                           | 2M    | CO1 | L1 |
| (b)   | What is equilibrium?                                                                                                                                                                                                                    | 2M    | CO1 | L1 |
| (c)   | Define friction.                                                                                                                                                                                                                        | 2M    | CO2 | L1 |
| (d)   | What is impending motion?                                                                                                                                                                                                               | 2M    | CO2 | L1 |
| (e)   | Define Young's modulus.                                                                                                                                                                                                                 | 2M    | CO3 | L1 |
| (f)   | What is a stepped bar?                                                                                                                                                                                                                  | 2M    | CO3 | L1 |
| (g)   | Define beam.                                                                                                                                                                                                                            | 2M    | CO4 | L1 |
| (h)   | What is uniformly distributed load?                                                                                                                                                                                                     | 2M    | CO4 | L1 |
| (i)   | Define simple bending.                                                                                                                                                                                                                  | 2M    | CO5 | L1 |
| (j)   | Define beam strength.                                                                                                                                                                                                                   | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                                         | Marks | CO  | BL |
| 2(a)  | State and explain Parallelogram law of forces.                                                                                                                                                                                          | 5M    | CO1 | L2 |
| (b)   | A force of 150 N acts at 30° to horizontal. Resolve into horizontal and vertical components.                                                                                                                                            | 5M    | CO1 | L3 |
| (OR)  |                                                                                                                                                                                                                                         |       |     |    |
| 3(a)  | State and explain Lami's theorem.                                                                                                                                                                                                       | 5M    | CO1 | L2 |
| (b)   | A beam is acted upon by two opposite equal forces of 25 N separated by 0.6 m. Find couple moment.                                                                                                                                       | 5M    | CO1 | L2 |
| 4(a)  | Define angle of repose and relation with coefficient of friction.                                                                                                                                                                       | 5M    | CO2 | L2 |
| (b)   | A body rests on inclined plane at 20°. Find coefficient of friction when motion is impending.                                                                                                                                           | 5M    | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                         |       |     |    |
| 5(a)  | Define friction and explain its types.                                                                                                                                                                                                  | 5M    | CO2 | L2 |
| (b)   | A block of 100 N is on rough horizontal plane, $\mu = 0.25$ . Find force required to move it.                                                                                                                                           | 5M    | CO2 | L2 |
| 6(a)  | State Hooke's law and explain limitations.                                                                                                                                                                                              | 5M    | CO3 | L2 |
| (b)   | A steel rod of length 1.5 m and area 300 mm <sup>2</sup> carries 60 kN. Find elongation if $E = 200$ GPa.                                                                                                                               | 5M    | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                         |       |     |    |
| 7.    | A stepped bar consists of two segments: $L_1 = 400$ mm, $A_1 = 400$ mm <sup>2</sup> ; $L_2 = 600$ mm, $A_2 = 200$ mm <sup>2</sup> . A load of 80 kN is applied. Determine stress in each section and total elongation ( $E = 200$ GPa). | 10M   | CO3 | L3 |
| 8(a)  | A cantilever beam of length 3 m carries point load 12 kN at free end. Draw SFD and BMD; find maximum BM.                                                                                                                                | 5M    | CO4 | L2 |
| (b)   | A simply supported beam of span 4 m carries 10 kN at 1m from the left end. Find reactions. Draw SFD and BMD for the beam.                                                                                                               | 5M    | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                         |       |     |    |
| 9.    | A simply supported beam of span 12 m carries UDL 4 kN/m from 2 m to 8 m from left support. Find reactions. Draw SFD and BMD.                                                                                                            | 10M   | CO4 | L3 |
| 10(a) | Define section modulus and explain its importance in beam design.                                                                                                                                                                       | 5M    | CO5 | L2 |
| (b)   | A circular beam of diameter 100 mm is subjected to a bending moment of 15 kN·m. Find the maximum bending stress.                                                                                                                        | 5M    | CO5 | L3 |
| (OR)  |                                                                                                                                                                                                                                         |       |     |    |
| 11(a) | Derive the expression for shear stress in beams and explain the significance of each term.                                                                                                                                              | 5M    | CO5 | L3 |
| (b)   | A beam section has a section modulus of $4 \times 10^5$ mm <sup>3</sup> and is subjected to a bending moment of 16 kN·m. Find the bending stress developed.                                                                             | 5M    | CO5 | L2 |



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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23QT01-SURVEY OF QUANTUM TECHNOLOGIES AND APPLICATIONS**

(ASE,CSE,CSE(AI&amp;ML),EEE and ME)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                                                | Marks        | CO        | BL        |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|
| 1(a)        | Define quantum state.                                                                                                                                              | 2M           | CO1       | L1        |
| (b)         | Explain wavefunction.                                                                                                                                              | 2M           | CO1       | L2        |
| (c)         | Define qubit.                                                                                                                                                      | 2M           | CO2       | L1        |
| (d)         | Compare qubit and classical bit.                                                                                                                                   | 2M           | CO2       | L1        |
| (e)         | Describe quantum sensing.                                                                                                                                          | 2M           | CO3       | L2        |
| (f)         | Analyze magnetometry.                                                                                                                                              | 2M           | CO3       | L1        |
| (g)         | Define Shannon Entropy.                                                                                                                                            | 2M           | CO4       | L1        |
| (h)         | Explain eavesdropping.                                                                                                                                             | 2M           | CO4       | L2        |
| (i)         | Define quantum materials.                                                                                                                                          | 2M           | CO5       | L1        |
| (j)         | Explain superconductors.                                                                                                                                           | 2M           | CO5       | L2        |
| <b>Q.No</b> | <b>All questions carry equal marks</b>                                                                                                                             | <b>Marks</b> | <b>CO</b> | <b>BL</b> |
| 2(a)        | Explain in detail the concept of quantum states and wavefunctions, including their mathematical representation and physical significance.                          | 5M           | CO1       | L2        |
| (b)         | Apply the probabilistic interpretation of quantum mechanics to determine how measurement outcomes are obtained from a given wavefunction.                          | 5M           | CO1       | L3        |
| <b>(OR)</b> |                                                                                                                                                                    |              |           |           |
| 3(a)        | Describe the Heisenberg Uncertainty Principle, including its mathematical form and its significance in limiting simultaneous measurements of physical quantities.  | 5M           | CO1       | L2        |
| (b)         | Analyze the phenomenon of quantum entanglement, highlighting its characteristics, non-classical correlations, and implications in quantum systems.                 | 5M           | CO1       | L4        |
| 4(a)        | Explain in detail the concept of qubits, including their mathematical representation, and describe the operation of quantum gates used to manipulate qubit states. | 5M           | CO2       | L2        |
| (b)         | Apply the principles of quantum circuits to illustrate how quantum computations are performed using a sequence of quantum gates.                                   | 5M           | CO2       | L3        |
| <b>(OR)</b> |                                                                                                                                                                    |              |           |           |
| 5(a)        | Describe the working principles of superconducting qubits, including their types and basic operational mechanisms.                                                 | 5M           | CO2       | L2        |
| (b)         | Analyze trapped ion systems as a platform for quantum computation, focusing on their advantages, limitations, and scalability.                                     | 5M           | CO2       | L3        |
| 6(a)        | Explain in detail the process of photon generation in quantum sensing, including the role of single and entangled photons in enhancing measurement sensitivity.    | 5M           | CO3       | L2        |
| (b)         | Apply the fundamental principles of quantum sensing to explain how measurement systems achieve high precision and accuracy in practical applications.              | 5M           | CO3       | L3        |
| <b>(OR)</b> |                                                                                                                                                                    |              |           |           |
| 7(a)        | Describe the working principle of atomic clocks, including the role of atomic transitions in achieving highly precise time measurement.                            | 5M           | CO3       | L2        |
| (b)         | Analyze various applications of quantum sensing, highlighting their advantages over classical sensing techniques in real-world scenarios.                          | 5M           | CO3       | L4        |
| 8(a)        | Explain the concept of Shannon entropy, including its mathematical formulation and its significance in quantifying information.                                    | 5M           | CO4       | L2        |
| (b)         | Apply the concept of entropy in communication systems to evaluate information content and efficiency of data transmission.                                         | 5M           | CO4       | L3        |
| <b>(OR)</b> |                                                                                                                                                                    |              |           |           |
| 9(a)        | Describe the fundamental principles of quantum communication, including how quantum states are used to transmit information.                                       | 5M           | CO4       | L2        |
| (b)         | Analyze the issues of security and eavesdropping in quantum communication, explaining how quantum principles help in detecting unauthorized access.                | 5M           | CO4       | L4        |
| 10(a)       | Explain in detail the concept of quantum materials, highlighting their unique properties and significance in modern physics and technology.                        | 5M           | CO5       | L2        |
| (b)         | Apply the properties of quantum materials to discuss their applications in emerging technologies such as quantum computing and spintronics.                        | 5M           | CO5       | L3        |
| <b>(OR)</b> |                                                                                                                                                                    |              |           |           |
| 11(a)       | Describe the characteristics and working principles of topological insulators and superconductors, emphasizing their distinct physical properties.                 | 5M           | CO5       | L2        |
| (b)         | Analyze the behavior of advanced quantum materials such as Mott insulators and quantum spin liquids, including their potential applications and challenges.        | 5M           | CO5       | L4        |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23QT02-FOUNDATIONS OF QUANTUM TECHNOLOGIES**

(AI&amp;DS,CSE(AI&amp;ML),ECE and EEE)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                      | Marks | CO  | BL |
|-------------|------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Define phase space.                                                                      | 2 M   | CO1 | L1 |
| (b)         | Explain the photoelectric effect.                                                        | 2 M   | CO1 | L2 |
| (c)         | What is Dirac bra-ket notation?                                                          | 2 M   | CO2 | L1 |
| (d)         | State and explain Heisenberg uncertainty principle.                                      | 2 M   | CO2 | L2 |
| (e)         | State the no-cloning theorem.                                                            | 2 M   | CO3 | L1 |
| (f)         | Define ladder operators.                                                                 | 2 M   | CO3 | L1 |
| (g)         | What is meant by thermal equilibrium?                                                    | 2 M   | CO4 | L2 |
| (h)         | Significance of entropy in thermodynamics.                                               | 2 M   | CO4 | L2 |
| (i)         | What is a qubit? How does it differ from a classical bit?                                | 2 M   | CO5 | L1 |
| (j)         | What is a Turing machine?                                                                | 2 M   | CO5 | L1 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| Q.No        | All questions carry equal marks                                                          | Marks | CO  | BL |
| 2(a)        | Discuss motion of a particle in a conservative field with examples.                      | 5 M   | CO1 | L2 |
| (b)         | Explain the classical harmonic oscillator in detail.                                     | 5 M   | CO1 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 3(a)        | Discuss the limitations of classical mechanics that lead to quantum mechanics.           | 5 M   | CO1 | L2 |
| (b)         | Explain de Broglie's wave-particle duality.                                              | 5 M   | CO1 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 4.          | Explain the postulates of quantum mechanics in detail.                                   | 10 M  | CO2 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 5(a)        | Discuss the significance and properties of unitary transformations in quantum mechanics. | 5 M   | CO2 | L2 |
| (b)         | Explain Hermitian operators and prove that eigenvalues are real.                         | 5 M   | CO2 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 6(a)        | Discuss quantum entanglement and its importance.                                         | 5 M   | CO3 | L2 |
| (b)         | Explain quantum superposition with an example.                                           | 5 M   | CO3 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 7(a)        | Discuss spin and angular momentum in quantum mechanics.                                  | 5 M   | CO3 | L2 |
| (b)         | Solve the Rabi problem of a spin- $\frac{1}{2}$ particle in a rotating magnetic field.   | 5 M   | CO3 | L3 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 8(a)        | Apply Gibbs principle to classical and quantum harmonic oscillators.                     | 5 M   | CO4 | L3 |
| (b)         | Discuss the first and second laws of thermodynamics briefly.                             | 5 M   | CO4 | L1 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 9(a)        | Distinguish between Bosons and Fermions.                                                 | 5 M   | CO4 | L2 |
| (b)         | Explain Fermi-Dirac statistics with examples.                                            | 5 M   | CO4 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 10(a)       | Explain decoherence and its effect on quantum information.                               | 5 M   | CO5 | L2 |
| (b)         | Explain Shannon entropy and its significance in information theory.                      | 5 M   | CO5 | L2 |
| <b>(OR)</b> |                                                                                          |       |     |    |
| 11(a)       | Discuss the role of Kraus operators in quantum systems.                                  | 5 M   | CO5 | L2 |
| (b)         | Explain the importance of post-quantum cryptography.                                     | 5 M   | CO5 | L2 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular Examinations

**23CSH1-MATHEMATICAL FOUNDATIONS FOR SECURITY**  
(CSE)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                                                        | Marks        | CO        | BL        |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|
| 1(a)        | Define a transition matrix in a Markov Chain.                                                                                                                              | 2 M          | CO1       | L1        |
| (b)         | Distinguish between a PDF and a CDF.                                                                                                                                       | 2 M          | CO1       | L2        |
| (c)         | What is an 'unbiased estimator'?                                                                                                                                           | 2 M          | CO2       | L1        |
| (d)         | Mention one advantage of the Maximum Likelihood Estimation method.                                                                                                         | 2 M          | CO2       | L2        |
| (e)         | Define the term 'Statistical Inference'.                                                                                                                                   | 2 M          | CO3       | L1        |
| (f)         | In PCA, what does a 'Principal Component' represent.                                                                                                                       | 2 M          | CO3       | L1        |
| (g)         | What is the Four Color Theorem in graph coloring?                                                                                                                          | 2 M          | CO4       | L1        |
| (h)         | Calculate the number of ways to arrange the letters in "ENGINEERING".                                                                                                      | 2 M          | CO4       | L2        |
| (i)         | State the Chinese Remainder Theorem.                                                                                                                                       | 2 M          | CO5       | L1        |
| (j)         | What is Modular Exponentiation and why is it used in RSA?                                                                                                                  | 2 M          | CO5       | L1        |
| <b>Q.No</b> | <b>All questions carry equal marks</b>                                                                                                                                     | <b>Marks</b> | <b>CO</b> | <b>BL</b> |
| 2(a)        | Illustrate the application of Markov Chains with a real-world state-transition example.                                                                                    | 5 M          | CO1       | L2        |
| (b)         | Explain the concept of Expected Value for a continuous random variable.                                                                                                    | 5 M          | CO1       | L2        |
| <b>(OR)</b> |                                                                                                                                                                            |              |           |           |
| 3.          | Compare and contrast Univariate and Multivariate Central Limit Theorems with respect to large sample sizes.                                                                | 10 M         | CO1       | L3        |
| 4.          | Elaborate on the distribution of estimators and how the variance of an estimator impacts its reliability.                                                                  | 10 M         | CO2       | L3        |
| <b>(OR)</b> |                                                                                                                                                                            |              |           |           |
| 5(a)        | Define Sampling Distributions and explain why they are fundamental to inference.                                                                                           | 5 M          | CO2       | L2        |
| (b)         | Explain the method of moments versus Maximum Likelihood.                                                                                                                   | 5 M          | CO2       | L2        |
| 6(a)        | Explain the "Curse of Dimensionality" in the context of multivariate models.                                                                                               | 5 M          | CO3       | L2        |
| (b)         | Describe how cross-validation helps in identifying model overfitting.                                                                                                      | 5 M          | CO3       | L2        |
| <b>(OR)</b> |                                                                                                                                                                            |              |           |           |
| 7.          | Discuss Classification Problems in multivariate statistics, specifically focusing on Linear Discriminant Analysis or similar frameworks.                                   | 10 M         | CO3       | L2        |
| 8(a)        | Explain Hamilton circuits and provide a necessary condition for their existence.                                                                                           | 5 M          | CO4       | L2        |
| (b)         | Discuss the Pigeonhole Principle as a technique for combinatorial enumeration.                                                                                             | 5 M          | CO1       | L2        |
| <b>(OR)</b> |                                                                                                                                                                            |              |           |           |
| 9.          | Explain Graph Coloring and its applications in scheduling problems or frequency assignments.                                                                               | 10 M         | CO2       | L2        |
| 10(a)       | Explain the process of finding the modular inverse using the Extended Euclidean Algorithm.                                                                                 | 5 M          | CO5       | L2        |
| (b)         | Discuss the properties of Prime Numbers related to Unique Factorization.                                                                                                   | 5 M          | CO5       | L2        |
| <b>(OR)</b> |                                                                                                                                                                            |              |           |           |
| 11.         | State Chinese Remainder Theorem and find X for the given set of congruent equations using CRT.<br>$X \equiv 1 \pmod{5}$<br>$X \equiv 1 \pmod{7}$<br>$X \equiv 3 \pmod{11}$ | 10 M         | CO5       | L3        |

**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular Examinations

**23ECH4-REAL TIME OPERATING SYSTEMS**  
(ECE)**01 MAY 2026**

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                        | Marks | CO  | BL |
|-------------|------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Define interrupt latency.                                                                                  | 2 M   | CO1 | L2 |
| (b)         | List the different states of a process.                                                                    | 2 M   | CO1 | L1 |
| (c)         | List any four basic functions of an RTOS.                                                                  | 2 M   | CO3 | L1 |
| (d)         | What is task synchronization in RTOS programming?                                                          | 2 M   | CO3 | L2 |
| (e)         | List any two sensors used in an Adaptive Cruise Control system.                                            | 2 M   | CO3 | L1 |
| (f)         | Explain why security is important in a smart card embedded system.                                         | 2 M   | CO3 | L2 |
| (g)         | List any two system calls used in Linux.                                                                   | 2 M   | CO4 | L1 |
| (h)         | Identify the difference between shell programming and system programming.                                  | 2 M   | CO4 | L1 |
| (i)         | Name any two core RT Linux API functions.                                                                  | 2 M   | CO3 | L1 |
| (j)         | Explain how mutex protects shared resources in RT Linux.                                                   | 2 M   | CO3 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| Q.No        | All questions carry equal marks                                                                            | Marks | CO  | BL |
| 2(a)        | Explain the major services provided by an operating system.                                                | 5 M   | CO1 | L2 |
| (b)         | Demonstrate the different task scheduling models used in RTOS.                                             | 5 M   | CO1 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 3(a)        | Compare preemptive and non-preemptive scheduling with respect to response time and task execution.         | 5 M   | CO2 | L2 |
| (b)         | Describe the features of a real-time operating system and explain why it is used in time-critical systems. | 5 M   | CO2 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 4.          | Describe the programming concepts of RTOS Windows CE with relevant examples.                               | 10 M  | CO2 | L3 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 5(a)        | Describe the architecture of VxWorks RTOS.                                                                 | 5M    | CO2 | L2 |
| (b)         | Illustrate the working principle of RT Linux RTOS.                                                         | 5M    | CO2 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 6(a)        | Explain the software architecture of a digital camera with suitable functional blocks.                     | 5M    | CO4 | L2 |
| (b)         | Explain the working principle of a smart card with suitable block representation.                          | 5M    | CO4 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 7(a)        | Describe the block diagram representation of embedded system of mobile phone software for key inputs.      | 5M    | CO4 | L2 |
| (b)         | Explain the software architecture used for handling key inputs in a mobile phone.                          | 5M    | CO4 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 8(a)        | Explain the hardware abstraction layer (HAL) in RTOS porting.                                              | 5M    | CO3 | L2 |
| (b)         | Illustrate the steps involved in configuring an RTOS kernel for a target microcontroller board.            | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 9(a)        | Analyse the advantages of shell programming for automation in Linux systems.                               | 5M    | CO3 | L4 |
| (b)         | Describe loops and branching statements in shell programming.                                              | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 10(a)       | Explain the use of semaphores for task synchronization in RT Linux.                                        | 5M    | CO3 | L2 |
| (b)         | Describe the steps involved in writing a program to display a message periodically in RT Linux.            | 5M    | CO3 | L3 |
| <b>(OR)</b> |                                                                                                            |       |     |    |
| 11.         | Describe the case study of appliance control using RT Linux system.                                        | 10M   | CO3 | L3 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23HS02-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

(AI&DS,CE,CSE,ECE and EEE)

Time : 3 hours

Max. Marks : 70

| Q.No | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                        | Marks      | CO        | BL         |      |          |        |      |          |        |     |     |    |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|------------|------|----------|--------|------|----------|--------|-----|-----|----|
| 1(a) | State the meaning of in-elastic.                                                                                                                                                                                                                                                                                                                                                                           | 2M         | CO1       | L1         |      |          |        |      |          |        |     |     |    |
| (b)  | List the scope of managerial economics.                                                                                                                                                                                                                                                                                                                                                                    | 2M         | CO1       | L1         |      |          |        |      |          |        |     |     |    |
| (c)  | State the term Marginal Cost.                                                                                                                                                                                                                                                                                                                                                                              | 2M         | CO2       | L1         |      |          |        |      |          |        |     |     |    |
| (d)  | List out the internal economies of scale.                                                                                                                                                                                                                                                                                                                                                                  | 2M         | CO2       | L1         |      |          |        |      |          |        |     |     |    |
| (e)  | Recite the term oligopoly.                                                                                                                                                                                                                                                                                                                                                                                 | 2M         | CO3       | L1         |      |          |        |      |          |        |     |     |    |
| (f)  | Name different pricing methods.                                                                                                                                                                                                                                                                                                                                                                            | 2M         | CO3       | L1         |      |          |        |      |          |        |     |     |    |
| (g)  | Define capital budgeting.                                                                                                                                                                                                                                                                                                                                                                                  | 2M         | CO4       | L1         |      |          |        |      |          |        |     |     |    |
| (h)  | Recall the definition of Net Present Value.                                                                                                                                                                                                                                                                                                                                                                | 2M         | CO4       | L1         |      |          |        |      |          |        |     |     |    |
| (i)  | State the meaning of a journal in accounting.                                                                                                                                                                                                                                                                                                                                                              | 2M         | CO5       | L1         |      |          |        |      |          |        |     |     |    |
| (j)  | List out the user of the accounting.                                                                                                                                                                                                                                                                                                                                                                       | 2M         | CO5       | L1         |      |          |        |      |          |        |     |     |    |
|      |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| Q.No | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                                            | Marks      | CO        | BL         |      |          |        |      |          |        |     |     |    |
| 2(a) | Elucidate income elasticity of demand and explain various types with a neat graph.                                                                                                                                                                                                                                                                                                                         | 5M         | CO1       | L2         |      |          |        |      |          |        |     |     |    |
| (b)  | Discuss qualitative method of the demand forecasting.                                                                                                                                                                                                                                                                                                                                                      | 5M         | CO1       | L2         |      |          |        |      |          |        |     |     |    |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 3(a) | Illustrate various factors affecting the elasticity of demand.                                                                                                                                                                                                                                                                                                                                             | 5M         | CO1       | L2         |      |          |        |      |          |        |     |     |    |
| (b)  | Describe the concept of the law of demand and explain its exceptions.                                                                                                                                                                                                                                                                                                                                      | 5M         | CO1       | L2         |      |          |        |      |          |        |     |     |    |
|      |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 4.   | A company provides the following financial data: <table><tr><th>Year</th><th>Sales (₹)</th><th>Profit (₹)</th></tr><tr><td>2022</td><td>2,00,000</td><td>40,000</td></tr><tr><td>2023</td><td>2,80,000</td><td>60,000</td></tr></table> Calculate the following:<br>(i) P/V Ratio, Contribution (ii) Fixed Costs (iii) Break-Even Sales<br>(iv) Margin of Safety (v) Expected Profit if Sales are ₹1,00,00 | Year       | Sales (₹) | Profit (₹) | 2022 | 2,00,000 | 40,000 | 2023 | 2,80,000 | 60,000 | 10M | CO2 | L3 |
| Year | Sales (₹)                                                                                                                                                                                                                                                                                                                                                                                                  | Profit (₹) |           |            |      |          |        |      |          |        |     |     |    |
| 2022 | 2,00,000                                                                                                                                                                                                                                                                                                                                                                                                   | 40,000     |           |            |      |          |        |      |          |        |     |     |    |
| 2023 | 2,80,000                                                                                                                                                                                                                                                                                                                                                                                                   | 60,000     |           |            |      |          |        |      |          |        |     |     |    |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 5(a) | Illustrate the Break-Even Point (BEP) with a graph and analyze its components.                                                                                                                                                                                                                                                                                                                             | 5M         | CO2       | L2         |      |          |        |      |          |        |     |     |    |
| (b)  | Discuss the concept of the least cost combination of inputs.                                                                                                                                                                                                                                                                                                                                               | 5M         | CO2       | L2         |      |          |        |      |          |        |     |     |    |
|      |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 6(a) | Define Monopoly. What are its main characteristics?                                                                                                                                                                                                                                                                                                                                                        | 5M         | CO3       | L2         |      |          |        |      |          |        |     |     |    |
| (b)  | Discuss the objectives of pricing policies.                                                                                                                                                                                                                                                                                                                                                                | 5M         | CO3       | L2         |      |          |        |      |          |        |     |     |    |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 7.   | Describe the concept of perfect competition and price determination under perfect competition.                                                                                                                                                                                                                                                                                                             | 10M        | CO3       | L2         |      |          |        |      |          |        |     |     |    |
|      |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |
| 8(a) | Explain traditional techniques of capital budgeting.                                                                                                                                                                                                                                                                                                                                                       | 5M         | CO4       | L2         |      |          |        |      |          |        |     |     |    |
| (b)  | Define capital and explain its significance in business.                                                                                                                                                                                                                                                                                                                                                   | 5M         | CO4       | L2         |      |          |        |      |          |        |     |     |    |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                            |            |           |            |      |          |        |      |          |        |     |     |    |

## 23HS02-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

| 9.   | <div>XYZ Ltd. is evaluating a project requiring an initial investment of ₹5,00,000. The expected Cash Flows After Tax (CFAT) over 5 years are as follows:</div> <table><tr><th>Year</th><th>CFAT (₹)</th></tr><tr><td>1</td><td>1,20,000</td></tr><tr><td>2</td><td>1,30,000</td></tr><tr><td>3</td><td>1,50,000</td></tr><tr><td>4</td><td>1,40,000</td></tr><tr><td>5</td><td>1,60,000</td></tr></table> <div>The discount rate is 10% and required to calculate Payback Period, Net Present Value and Profitability Index</div> | Year | CFAT (₹) | 1 | 1,20,000 | 2 | 1,30,000 | 3 | 1,50,000 | 4 | 1,40,000 | 5 | 1,60,000 | 10M | CO4 | L3 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|---|----------|---|----------|---|----------|---|----------|---|----------|-----|-----|----|
| Year | CFAT (₹)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |
| 1    | 1,20,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |
| 2    | 1,30,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |
| 3    | 1,50,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |
| 4    | 1,40,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |
| 5    | 1,60,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |          |   |          |   |          |   |          |   |          |   |          |     |     |    |

| 10.             | <div>Prepare Trading and Profit &amp; Loss Account and Balance Sheet for the year ending March 31, 2024, from the following balances:</div> <div>Trial Balance as on March 31, 2024</div> <table><tr><th>Particulars</th><th>Amount (₹)</th><th>Particulars</th><th>Amount (₹)</th></tr><tr><td>Opening Stock</td><td>40,000</td><td>Sales</td><td>2,80,000</td></tr><tr><td>Purchases</td><td>1,60,000</td><td>Returns Outward</td><td>2,000</td></tr><tr><td>Wages</td><td>15,000</td><td>Discount Received</td><td>3,000</td></tr><tr><td>Carriage Inward</td><td>5,000</td><td>Commission Received</td><td>5,000</td></tr><tr><td>Salaries</td><td>25,000</td><td>Creditors</td><td>30,000</td></tr><tr><td>Rent</td><td>10,000</td><td>Capital</td><td>1,32,000</td></tr><tr><td>Machinery</td><td>1,28,000</td><td></td><td></td></tr><tr><td>Debtors</td><td>35,000</td><td></td><td></td></tr><tr><td>Returns Inward</td><td>4,000</td><td></td><td></td></tr><tr><td>Cash</td><td>20,000</td><td></td><td></td></tr><tr><td>Drawings</td><td>10,000</td><td></td><td></td></tr><tr><td>Total</td><td>4,52,000</td><td></td><td>4,52,000</td></tr></table> <div>Adjustments:</div> <ul style="list-style-type: none"><li>Closing stock is valued at ₹50,000.</li><li>Outstanding Wages ₹2,000.</li><li>Outstanding Salaries ₹3,000.</li></ul> <div>Depreciation on machinery at 10%.</div> | Particulars         | Amount (₹) | Particulars | Amount (₹) | Opening Stock | 40,000 | Sales | 2,80,000 | Purchases | 1,60,000 | Returns Outward | 2,000 | Wages | 15,000 | Discount Received | 3,000 | Carriage Inward | 5,000 | Commission Received | 5,000 | Salaries | 25,000 | Creditors | 30,000 | Rent | 10,000 | Capital | 1,32,000 | Machinery | 1,28,000 |  |  | Debtors | 35,000 |  |  | Returns Inward | 4,000 |  |  | Cash | 20,000 |  |  | Drawings | 10,000 |  |  | Total | 4,52,000 |  | 4,52,000 | 10M | CO5 | L3 |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------|-------------|------------|---------------|--------|-------|----------|-----------|----------|-----------------|-------|-------|--------|-------------------|-------|-----------------|-------|---------------------|-------|----------|--------|-----------|--------|------|--------|---------|----------|-----------|----------|--|--|---------|--------|--|--|----------------|-------|--|--|------|--------|--|--|----------|--------|--|--|-------|----------|--|----------|-----|-----|----|
| Particulars     | Amount (₹)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Particulars         | Amount (₹) |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Opening Stock   | 40,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Sales               | 2,80,000   |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Purchases       | 1,60,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Returns Outward     | 2,000      |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Wages           | 15,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Discount Received   | 3,000      |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Carriage Inward | 5,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Commission Received | 5,000      |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Salaries        | 25,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Creditors           | 30,000     |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Rent            | 10,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Capital             | 1,32,000   |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Machinery       | 1,28,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |            |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Debtors         | 35,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |            |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Returns Inward  | 4,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |            |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Cash            | 20,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |            |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Drawings        | 10,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |            |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |
| Total           | 4,52,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     | 4,52,000   |             |            |               |        |       |          |           |          |                 |       |       |        |                   |       |                 |       |                     |       |          |        |           |        |      |        |         |          |           |          |  |  |         |        |  |  |                |       |  |  |      |        |  |  |          |        |  |  |       |          |  |          |     |     |    |

|       |                                                                                                                                                                                                                                                                                                  |    |     |    |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| (OR)  |                                                                                                                                                                                                                                                                                                  |    |     |    |
| 11(a) | <div>A firm reports the following financial details:</div> <div>Net Sales = ₹10,00,000</div> <div>Gross Profit = ₹4,00,000</div> <div>Net Profit = ₹1,50,000</div> <div>Operating Profit = ₹2,00,000</div> <div>Compute the Gross Profit Ratio ,Net Profit ratio , Operating Profit ratio.</div> | 5M | CO5 | L3 |
| (b)   | <div>Explain the double-entry system of accounting and discuss its advantages and disadvantages.</div>                                                                                                                                                                                           | 5M | CO5 | L2 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B. Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23HS03-INDUSTRIAL MANAGEMENT**

(ASE &amp; ME)

Time : 3 hours

Max. Marks : 70

| Q.No      | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks  | CO  | BL |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|----|----|----|----|----|----|----|---|----|-----------|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|----|-----|----|
| 1(a)      | List the functions of management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2M     | CO1 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | What is preventive maintenance?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2M     | CO1 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (c)       | What is work study? Mention its importance?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (d)       | Differentiate between method study and time study.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (e)       | Why is Queuing Assurance important?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2M     | CO3 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (f)       | Define Six Sigma.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2M     | CO3 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (g)       | Mention any two objectives of Financial Management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2M     | CO4 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (h)       | What is Stock Management?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2M     | CO4 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (i)       | List two types of Wage Incentive Plans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2M     | CO5 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (j)       | Mention two key components of supply chain management (SCM).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2M     | CO5 | L1 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| Q.No      | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks  | CO  | BL |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 2(a)      | List out and outline the Henry Fayol's principles of Management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5M     | CO1 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Illustrate product layout with a neat sketch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M     | CO1 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (OR)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 3(a)      | Discuss the role of an industrial engineer in the industrial management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5M     | CO1 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Evaluate various quantitative techniques for optimal design of layouts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5M     | CO1 | L3 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 4(a)      | Discuss the objectives and benefits of work study.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Explain the procedure for conducting work measurement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (OR)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 5(a)      | Illustrate string diagram with an example.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Discuss the steps followed in PMTS (Predetermined Motion Time System) method.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M     | CO2 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 6(a)      | Demonstrate the construction and significance of an R-control chart in quality control.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5M     | CO3 | L3 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Explain zero defect concept in Total Quality Management (TQM).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5M     | CO3 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (OR)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 7.        | <div>You are given the values of sample means (<math>\bar{X}</math>) and standard deviation (S) for 10samples of size 5 each. Draw charts for the means (<math>\bar{X}</math>) and standard deviation(S). comment on the state of control of the process. For <math>n=5</math>, <math>A_3 = 1.427</math>, <math>B_3 = 0</math>, <math>B_4 = 2.09</math>.</div> <table><tr><td>Sample</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td><math>\bar{X}</math></td><td>43</td><td>49</td><td>40</td><td>44</td><td>45</td><td>38</td><td>51</td><td>46</td><td>42</td><td>43</td></tr><tr><td>S</td><td>5</td><td>6</td><td>5</td><td>7</td><td>6</td><td>4</td><td>8</td><td>6</td><td>4</td><td>6</td></tr></table> | Sample | 1   | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9 | 10 | $\bar{X}$ | 43 | 49 | 40 | 44 | 45 | 38 | 51 | 46 | 42 | 43 | S | 5 | 6 | 5 | 7 | 6 | 4 | 8 | 6 | 4 | 6 | 5M | CO3 | L3 |
| Sample    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2      | 3   | 4  | 5  | 6  | 7  | 8  | 9  | 10 |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| $\bar{X}$ | 43                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 49     | 40  | 44 | 45 | 38 | 51 | 46 | 42 | 43 |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| S         | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6      | 5   | 7  | 6  | 4  | 8  | 6  | 4  | 6  |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 8(a)      | A project costs ₹1,80,000 and is expected to generate ₹70,000 annually for 4years. If the discount rate is 10%, calculate the Profitability Index (PI) and the Payback Period                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M     | CO4 | L3 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Explain the different types of ratios used in financial analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5M     | CO4 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (OR)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 9.        | <div>A company is considering two investment projects, A and B. The details are given below:</div> <div><ul style="list-style-type: none"><li>Project A: Initial Investment = ₹1,50,000, Annual Cash Inflows = ₹50,000 for 5 years</li><li>Project B: Initial Investment = ₹2,00,000, Annual Cash Inflows = ₹70,000 for 5 years</li><li>Discount Rate = 10%</li></ul></div> <div>Compute and compare the following for both projects to determine which project is better:</div> <div>(i) Net Present Value (NPV) (ii) Profitability Index (PI) (iii) Payback Period</div>                                                                                                                                                                                                             | 10M    | CO4 | L3 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 10(a)     | Describe different types of Job Evaluation methods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5M     | CO5 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Explain any two quantitative methods used in Merit Rating.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5M     | CO5 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (OR)      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |     |    |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| 11(a)     | Describe the steps involved in implementing value engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5M     | CO5 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |
| (b)       | Discuss the importance of wage incentive plans in employee motivation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5M     | CO5 | L2 |    |    |    |    |    |    |   |    |           |    |    |    |    |    |    |    |    |    |    |   |   |   |   |   |   |   |   |   |   |   |    |     |    |



**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING(AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram - 521 230 :: NTR Dist.:: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23ME09-OPTIMIZATION TECHNIQUES**

(CSE(AI&amp;ML) and IT)

Time : 3 hours

Max. Marks :70

| Q.No        | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks        | CO        | BL        |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|
| 1(a)        | Illustrate the constraint surface in an optimization problem?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2M           | CO1       | L2        |
| (b)         | Mention the necessary and sufficient conditions for Multi variable optimization problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2M           | CO1       | L1        |
| (c)         | Define the feasible and optimal solution in linear programming problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2M           | CO2       | L2        |
| (d)         | Write the difference between slack and surplus variable in LPP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2M           | CO2       | L1        |
| (e)         | List out the methods to obtain basic feasible solutions of a balanced transportation problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2M           | CO3       | L1        |
| (f)         | What are the number of basic variables and non-basic variables in LPP generated by a transportation model with m-sources and n-destinations?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2M           | CO3       | L2        |
| (g)         | List out the solution methods for one dimensional non-linear optimization problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2M           | CO4       | L1        |
| (h)         | Write any TWO characteristics of constrained optimization problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2M           | CO4       | L1        |
| (i)         | Mention the engineering applications of dynamic programming problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2M           | CO5       | L1        |
| (j)         | Define the following terms in dynamic programming (i) Optimal policy (ii) Optimal decision rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2M           | CO5       | L2        |
| <b>Q.No</b> | <b>All questions carry equal marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Marks</b> | <b>CO</b> | <b>BL</b> |
| 2(a)        | Discuss the necessary and sufficient conditions for maximum/minimum of a multivariable Optimization problem with equality constraints.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5M           | CO1       | L2        |
| (b)         | Find the stationary/extreme points of the function<br>$u = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5M           | CO1       | L3        |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |           |           |
| 3(a)        | Draw and Identify the constraint surface for the given constraint inequalities $2x_1 + 3x_2 \leq 12$ , $2x_1 + x_2 \leq 8$ , $-x_1 \leq 0$ , $-x_2 \leq 0$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5M           | CO1       | L3        |
| (b)         | IBM produces two kinds of memory chips (Chip-I and Chip-2) for memory usage. The unit selling price is \$15 for Chip-I and \$25 for Chip-2. To make one Chip-I, IBM has to invest 3 hours of skilled labour, 2 hours of unskilled labour and 1 unit of raw material. To make one Chip-2, it takes 4 hours of skilled labour, 3 hours of unskilled labour, and 2 units of raw material. The company has 100 hours of skilled labour, 70 hours of unskilled labour and 30 units of raw material available, and is interested to utilize the full potential of skilled labour. The sales contract signed by IBM requires that at least 3 units of chip-2 have to be produced and any fractional quantity is acceptable. <b>Formulate</b> a linear programme to help IBM determine its optimal product mix. | 5M           | CO2       | L3        |
| 4.          | Describe the Simplex algorithm for solution of linear programming problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10M          | CO2       | L2        |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |           |           |



## 23ME09-OPTIMIZATION TECHNIQUES

| 5(a)                     | Convert the following LPP in to Standard form<br>$\begin{aligned} \text{Max } & 2x_1 + x_2 - x_3 \\ \text{S.T } & 2x_1 + x_2 - x_3 \leq 5 \\ & -3x_1 + 2x_2 + 3x_3 \geq -3 \\ & x_1 - 3x_2 + 4x_3 \geq 2 \\ & x_1 + x_2 + x_3 = 4 \\ & x_1 \geq 0, x_2 \geq 1 \text{ and } x_3 \text{ is unrestricted in sign} \end{aligned}$                                                                                                                                                                                                                                                        | 5M                      | CO2 | L3 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----|----|-------------------------|----|-------------------------|----|---|---|---|---|----|----|---|---|---|---|----|----|---|---|---|---|----|--------------------------|----|----|----|----|-----|----|-----|----|
| (b)                      | Find the optimal solution for the following LPP using Graphical Method<br>$\begin{aligned} \text{Max } & x_1 + 5x_2 \\ \text{S.T } & -x_1 + 3x_2 \leq 10 \\ & x_1 + x_2 \leq 6 \\ & x_1 - x_2 \leq 2 \\ & x_1, x_2 \geq 0 \end{aligned}$                                                                                                                                                                                                                                                                                                                                             | 5M                      | CO2 | L3 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 6.                       | Discuss any one procedure to find Initial Basic feasible solution (X) for $X_{ij}$ being the number of units of material to be transported, with three sources and four destinations, given the demands and supply quantities, which is the special case of linear programming problem.                                                                                                                                                                                                                                                                                              | 10M                     | CO3 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (OR)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |     |    |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 7(a)                     | Find the Initial Basic Feasible solution for the given transportation problem below using North-west rule. <table border="1"><tr><th>Destinations<br/>Sources</th><th>D1</th><th>D2</th><th>D3</th><th>D4</th><th>Availability/<br/>Supply</th></tr><tr><td>S1</td><td>5</td><td>2</td><td>4</td><td>3</td><td>30</td></tr><tr><td>S2</td><td>6</td><td>4</td><td>9</td><td>5</td><td>40</td></tr><tr><td>S3</td><td>2</td><td>3</td><td>8</td><td>1</td><td>55</td></tr><tr><td>Requirements/<br/>Demands</td><td>15</td><td>20</td><td>40</td><td>50</td><td>125</td></tr></table> | Destinations<br>Sources | D1  | D2 | D3                      | D4 | Availability/<br>Supply | S1 | 5 | 2 | 4 | 3 | 30 | S2 | 6 | 4 | 9 | 5 | 40 | S3 | 2 | 3 | 8 | 1 | 55 | Requirements/<br>Demands | 15 | 20 | 40 | 50 | 125 | 5M | CO3 | L3 |
| Destinations<br>Sources  | D1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | D2                      | D3  | D4 | Availability/<br>Supply |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| S1                       | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                       | 4   | 3  | 30                      |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| S2                       | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4                       | 9   | 5  | 40                      |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| S3                       | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3                       | 8   | 1  | 55                      |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| Requirements/<br>Demands | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 20                      | 40  | 50 | 125                     |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (b)                      | Discuss the formulation of balanced transportation problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M                      | CO3 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 8(a)                     | Describe the iterative procedure of Fibonacci search method for finding the solution to one dimensional minimization problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5M                      | CO4 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (b)                      | List out the engineering applications of non-linear optimization problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5M                      | CO4 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (OR)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |     |    |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 9(a)                     | Develop the algorithmic steps of Steepest Decent method for minimization of an unconstrained optimization problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5M                      | CO4 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (b)                      | Explain the solution of constrained non-linear programming problem using penalty function approach.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5M                      | CO4 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 10(a)                    | Illustrate the dynamic programming approach for finding the solution to serial multistage decision problem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M                      | CO5 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (b)                      | List out the types of multistage decision problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5M                      | CO5 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (OR)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |     |    |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| 11(a)                    | Explain the concept of principle of optimality using the recursive relations in the stage-wise decision process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5M                      | CO5 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |
| (b)                      | Using dynamic programming find the three nonnegative real numbers such that sum of the squares of these is minimum with the restriction that their sum is not less than 45.                                                                                                                                                                                                                                                                                                                                                                                                          | 5M                      | CO5 | L2 |                         |    |                         |    |   |   |   |   |    |    |   |   |   |   |    |    |   |   |   |   |    |                          |    |    |    |    |     |    |     |    |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AD01-STATISTICAL METHODS FOR DATA SCIENCE**

(AI&amp;DS)

Time : 3 hours

Max. Marks : 70

Bosley  
6/5/26

| Q.No | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                | Marks                | CO                                      | BL                   |      |    |    |      |   |    |  |  |  |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------|----------------------|------|----|----|------|---|----|--|--|--|
| 1(a) | Write the commonly used statistical methods in data science.                                                                                                                                                                                                                                                                                                                                       | 2M                   | CO1                                     | L1                   |      |    |    |      |   |    |  |  |  |
| (b)  | Write any two properties of Normal distribution.                                                                                                                                                                                                                                                                                                                                                   | 2M                   | CO1                                     | L1                   |      |    |    |      |   |    |  |  |  |
| (c)  | Give an example to differentiate parameter and statistic.                                                                                                                                                                                                                                                                                                                                          | 2M                   | CO2                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (d)  | Write the formula to construct the Confidence Interval for difference of means in small samples when the samples are (i) Independent (ii) Dependent.                                                                                                                                                                                                                                               | 2M                   | CO2                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (e)  | Specify the two lines of regression.                                                                                                                                                                                                                                                                                                                                                               | 2M                   | CO3                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (f)  | What is the significance of Multiple R-Squared value?                                                                                                                                                                                                                                                                                                                                              | 2M                   | CO3                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (g)  | What are the various methods to determine the Trend in time series?                                                                                                                                                                                                                                                                                                                                | 2M                   | CO4                                     | L1                   |      |    |    |      |   |    |  |  |  |
| (h)  | Estimate the value of y when x=2 using the trend equation $y = 3 e^{0.5x}$                                                                                                                                                                                                                                                                                                                         | 2M                   | CO4                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (i)  | What is the significance of Sigmoid function in Logistic regression?                                                                                                                                                                                                                                                                                                                               | 2M                   | CO5                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (j)  | If the logistic model is given as $\log(odds) = -5 + 0.9 x_1$ , Calculate the probability of y (=1) when $x_1 = 10$ .                                                                                                                                                                                                                                                                              | 2M                   | CO5                                     | L2                   |      |    |    |      |   |    |  |  |  |
| Q.No | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                                    | Marks                | CO                                      | BL                   |      |    |    |      |   |    |  |  |  |
| 2(a) | Illustrate the importance of Line chart, Bar chart and Pie chart in Data Visualization.                                                                                                                                                                                                                                                                                                            | 5M                   | CO1                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (b)  | Explain how PCA is used to reduce the dimensionality of a dataset, what steps are involved in performing PCA?                                                                                                                                                                                                                                                                                      | 5M                   | CO1                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                         |                      |      |    |    |      |   |    |  |  |  |
| 3(a) | If 25% of the bolts produced by a machine are defective, if 5 bolts are chosen at random, determine the probability that (i) exactly one bolt (ii) none of the bolts will be defective.                                                                                                                                                                                                            | 5M                   | CO1                                     | L3                   |      |    |    |      |   |    |  |  |  |
| (b)  | At a checkout counter customers arrive at an average of 1.5 per minute. Find the probability that (i) at most 2 will arrive in any given minute (ii) Exactly 3 will arrive in any given minute. (iii) At least 2 will arrive during an interval of 2 minute.                                                                                                                                       | 5M                   | CO1                                     | L3                   |      |    |    |      |   |    |  |  |  |
| 4(a) | A sample of 400 individuals is found to have a mean height of 67.47inches. Can it be reasonably regarded as a sample from a large population with a mean height of 67.39 inches and standard deviation 1.30 inches. Also obtain the 95% confidence limits for the population mean height.                                                                                                          | 5M                   | CO2                                     | L4                   |      |    |    |      |   |    |  |  |  |
| (b)  | Describe the following (i) Hypothesis (ii) Null and Alternate Hypothesis (iii) Point and Interval estimation.                                                                                                                                                                                                                                                                                      | 5M                   | CO2                                     | L2                   |      |    |    |      |   |    |  |  |  |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                         |                      |      |    |    |      |   |    |  |  |  |
| 5(a) | Two types of new cars produced in U.S.A. are tested for petrol mileage, a sample from type1 consisting of 42 cars averaged 15Kmpl while the sample from type2 consisting of 80 cars averaged 11.5 Kmpl with population variances as 2.0 and 1.5 respectively. Test whether there is any significant difference in the petrol consumption of these two types of cars at 0.01 level of significance. | 5M                   | CO2                                     | L4                   |      |    |    |      |   |    |  |  |  |
| (b)  | Construct 95% confidence Interval for the Mean of a normality distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, and 14.                                                                                                                                                                                                                           | 5M                   | CO2                                     | L4                   |      |    |    |      |   |    |  |  |  |
| 6(a) | From the following information about advertising expenditure(X) and sales(Y), Estimate (i) The advertising budget if the company wants to attain sales target of Rs.120 lakhs. (ii) The sales when advertising expenditure is Rs.15 lakhs. Given that the correlation coefficient between X and Y is 0.8.                                                                                          | 5M                   | CO3                                     | L3                   |      |    |    |      |   |    |  |  |  |
|      | <table><tr><td></td><td>Advertising Expenditure (X) (Rs. lakhs)</td><td>Sales(Y) (Rs. lakhs)</td></tr><tr><td>Mean</td><td>10</td><td>90</td></tr><tr><td>s.d.</td><td>3</td><td>12</td></tr></table>                                                                                                                                                                                              |                      | Advertising Expenditure (X) (Rs. lakhs) | Sales(Y) (Rs. lakhs) | Mean | 10 | 90 | s.d. | 3 | 12 |  |  |  |
|      | Advertising Expenditure (X) (Rs. lakhs)                                                                                                                                                                                                                                                                                                                                                            | Sales(Y) (Rs. lakhs) |                                         |                      |      |    |    |      |   |    |  |  |  |
| Mean | 10                                                                                                                                                                                                                                                                                                                                                                                                 | 90                   |                                         |                      |      |    |    |      |   |    |  |  |  |
| s.d. | 3                                                                                                                                                                                                                                                                                                                                                                                                  | 12                   |                                         |                      |      |    |    |      |   |    |  |  |  |



## 23AD01-STATISTICAL METHODS FOR DATA SCIENCE

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------|---------------------------|-------------|-------------|------|------|------|------|-------|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|------|----|----|----|----|--|--|--|
| (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | By the method of least squares, Determine the straight line $y = a + bx$ that best fits the following data                                                                                                                                                                                                                                                                                                                          | 5M                        | CO3                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| <table><tr><td><math>x</math></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td><math>y</math></td><td>14</td><td>27</td><td>40</td><td>55</td><td>68</td></tr></table>                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                     | $x$                       | 1                     | 2                         | 3           | 4           | 5    | $y$  | 14   | 27   | 40    | 55   | 68 |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| $x$                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2                         | 3                     | 4                         | 5           |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| $y$                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 14                                                                                                                                                                                                                                                                                                                                                                                                                                  | 27                        | 40                    | 55                        | 68          |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (OR)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 7(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Describe Multiple linear regression and write the procedure to fit a multiple regression equation with two independent variables (say $x_1, x_2$ ).                                                                                                                                                                                                                                                                                 | 5M                        | CO3                   | L2                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | The following regression equation is given to predict Student Scores ( $y$ ) based on Study Hours ( $x_1$ ) and Attendance ( $x_2$ ): $y = 50 + 5x_1 + 3x_2$ . The standard errors of the coefficients are $SE(b_1) = 1.2$ , $SE(b_2) = 2.3$ and the number of observations is 25. Estimate the 95% confidence interval for the coefficients of Study Hours and Attendance.                                                         | 5M                        | CO3                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 8(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Describe the Method of Least Squares for fitting a straight-line trend. What are its advantages?                                                                                                                                                                                                                                                                                                                                    | 5M                        | CO4                   | L2                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Fit a trend line by the method of semi-averages for the given data.                                                                                                                                                                                                                                                                                                                                                                 | 5M                        | CO4                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| <table><tr><td>Year</td><td>1990</td><td>1991</td><td>1992</td><td>1993</td><td>1994</td><td>1995</td><td>1996</td><td>1997</td></tr><tr><td>Sales</td><td>15</td><td>11</td><td>20</td><td>10</td><td>15</td><td>25</td><td>35</td><td>30</td></tr></table>                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                     | Year                      | 1990                  | 1991                      | 1992        | 1993        | 1994 | 1995 | 1996 | 1997 | Sales | 15   | 11 | 20 | 10 | 15 | 25   | 35 | 30 |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| Year                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1990                                                                                                                                                                                                                                                                                                                                                                                                                                | 1991                      | 1992                  | 1993                      | 1994        | 1995        | 1996 | 1997 |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| Sales                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11                        | 20                    | 10                        | 15          | 25          | 35   | 30   |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (OR)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 9.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Calculate the seasonal indices for the following data of sales (in thousands) of a firm by the Ratio to Trend Method.                                                                                                                                                                                                                                                                                                               | 10M                       | CO4                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| <table><tr><td>Year</td><td>1st Quarter</td><td>2nd Quarter</td><td>3rd Quarter</td><td>4th Quarter</td></tr><tr><td>2016</td><td>30</td><td>40</td><td>36</td><td>34</td></tr><tr><td>2017</td><td>34</td><td>52</td><td>50</td><td>44</td></tr><tr><td>2018</td><td>40</td><td>58</td><td>54</td><td>48</td></tr><tr><td>2019</td><td>54</td><td>76</td><td>68</td><td>62</td></tr><tr><td>2020</td><td>80</td><td>92</td><td>86</td><td>82</td></tr></table> |                                                                                                                                                                                                                                                                                                                                                                                                                                     | Year                      | 1st Quarter           | 2nd Quarter               | 3rd Quarter | 4th Quarter | 2016 | 30   | 40   | 36   | 34    | 2017 | 34 | 52 | 50 | 44 | 2018 | 40 | 58 | 54 | 48 | 2019 | 54 | 76 | 68 | 62 | 2020 | 80 | 92 | 86 | 82 |  |  |  |
| Year                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1st Quarter                                                                                                                                                                                                                                                                                                                                                                                                                         | 2nd Quarter               | 3rd Quarter           | 4th Quarter               |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30                                                                                                                                                                                                                                                                                                                                                                                                                                  | 40                        | 36                    | 34                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 34                                                                                                                                                                                                                                                                                                                                                                                                                                  | 52                        | 50                    | 44                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2018                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 40                                                                                                                                                                                                                                                                                                                                                                                                                                  | 58                        | 54                    | 48                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 54                                                                                                                                                                                                                                                                                                                                                                                                                                  | 76                        | 68                    | 62                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 80                                                                                                                                                                                                                                                                                                                                                                                                                                  | 92                        | 86                    | 82                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 10(a)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Write the major differences between linear regression and logistic regression.                                                                                                                                                                                                                                                                                                                                                      | 5M                        | CO5                   | L2                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (b)                                                                                                                                                                                                                                                                                                                                                                                                                                                             | A political analyst uses logistic regression to predict whether a candidate will win (1) or lose (0) an election based on the number of campaign rallies attended ( $x_1$ ). The logistic regression equation is: $Z = -4 + 0.8x_1$<br>(i) What is the probability that a candidate who attended 10 rallies will win the election? (ii) How many rallies must a candidate attend to have a probability of winning greater than 80%? | 5M                        | CO5                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| (OR)                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 11.                                                                                                                                                                                                                                                                                                                                                                                                                                                             | A school uses logistic regression to predict whether a student will pass an exam (1) or fail (0) based on the number of study hours ( $x_1$ ). The logistic regression equation is: $\log(odds) = -2 + 0.5x_1$<br>Calculate the Residual deviance for this logistic regression model from the following data.                                                                                                                       | 10M                       | CO5                   | L3                        |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| <table><tr><td>Student</td><td>Study Hours (<math>x_1</math>)</td><td>Actual Result <math>y</math> (Class)</td></tr><tr><td>1</td><td>4</td><td>0</td></tr><tr><td>2</td><td>6</td><td>1</td></tr><tr><td>3</td><td>3</td><td>0</td></tr><tr><td>4</td><td>7</td><td>1</td></tr><tr><td>5</td><td>5</td><td>1</td></tr></table>                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     | Student                   | Study Hours ( $x_1$ ) | Actual Result $y$ (Class) | 1           | 4           | 0    | 2    | 6    | 1    | 3     | 3    | 0  | 4  | 7  | 1  | 5    | 5  | 1  |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| Student                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Study Hours ( $x_1$ )                                                                                                                                                                                                                                                                                                                                                                                                               | Actual Result $y$ (Class) |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0                         |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                         |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0                         |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                         |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1                         |                       |                           |             |             |      |      |      |      |       |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |      |    |    |    |    |  |  |  |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING(AUTONOMOUS)**

L.B. Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist.: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23FE13-COMPLEX VARIABLES, PROBABILITY AND STATISTICS**

(ASE &amp; ME)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                 | Marks | CO  | BL |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Check if the function $f(z) = z^2 + z$ is analytic or not.                                                                          | 2M    | CO1 | L2 |
| (b)         | Write Cauchy - Reimann equations in Cartesian and Polar form.                                                                       | 2M    | CO1 | L1 |
| (c)         | Calculate the zeros and poles of the function $f(z) = \frac{z^2 - 2z}{(z^2 + 1)(z^2 - 1)}$ .                                        | 2M    | CO2 | L2 |
| (d)         | Write Maclaurin's series expansion of the function $e^z$ .                                                                          | 2M    | CO2 | L1 |
| (e)         | A telephone operator receives an average of 2 calls per minute. What is the probability of receiving no calls in a given minute?    | 2M    | CO3 | L2 |
| (f)         | Define the Poisson distribution.                                                                                                    | 2M    | CO3 | L1 |
| (g)         | Compute the finite population correction factor when $n = 50$ and $N = 500$ .                                                       | 2M    | CO4 | L2 |
| (h)         | A study involves a sample of 225 individuals drawn from a population with a standard deviation of 18. Calculate the standard error. | 2M    | CO4 | L2 |
| (i)         | Explain types of errors.                                                                                                            | 2M    | CO5 | L1 |
| (j)         | Find the tabulated value of $F_{0.05}$ with d.o.f $\nu_1 = 4$ , $\nu_2 = 12$ if $S_2^2 > S_1^2$                                     | 2M    | CO5 | L2 |
| Q.No        | Compulsory Question                                                                                                                 | Marks | CO  | BL |
| 2(a)        | Apply Milne-Thomson method to construct an analytic function whose real part is $u = x^3 - 3xy^2$ .                                 | 5M    | CO1 | L3 |
| (b)         | Show that $u(x, y) = e^x \cos y$ is harmonic and hence find its harmonic conjugate.                                                 | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                                     |       |     |    |
| 3(a)        | Using Cauchy's Integral formula evaluate $\int_C \frac{e^z}{(z-1)(z-4)} dz$ where C is $ z  = 2$                                    | 5M    | CO1 | L3 |
| (b)         | Using Cauchy's integral formula evaluate $\int_C \frac{z^3 + 3z^2 + 2z - 4}{(z-2)^3} dz$ where C is the $ z  = 3$                   | 5M    | CO1 | L3 |
| 4(a)        | Expand $f(z) = \frac{1}{z^2 - 4z + 3}$ as Laurent's series the in the ring shaped region $1 <  z  < 3$                              | 5M    | CO2 | L3 |
| (b)         | Find the Taylor's series expansion of the function $f(z) = \frac{1}{z^2 + z - 6}$ about $z = 1$                                     | 5M    | CO2 | L3 |
| <b>(OR)</b> |                                                                                                                                     |       |     |    |
| 5(a)        | Applying Residue theorem evaluate $\oint_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ where 'C' is the circular path $ z  = \frac{3}{2}$   | 5M    | CO2 | L3 |
| (b)         | Find the poles of the function $f(z) = \frac{z+1}{z(z-2)}$ and the residues at each pole.                                           | 5M    | CO2 | L3 |



### 23FE13-COMPLEX VARIABLES, PROBABILITY AND STATISTICS

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      |      |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------|------|-------|--------|----------|-----|-----|-----|-----|----------------|------|------|------|-------|--------|----------|----|-----|----|---|----|-----|----|
| 6(a)            | A businessman goes to hotels X, Y, Z, 20%, 50%, and 30% of the time respectively. It is known that 5%,4%,8% of the rooms in X,Y,Z hotels have faulty plumbing. What is the probability that business man's room having faulty plumbing is assigned to hotel Z.                                                                                                                                                                                                                      | 5M              | CO3  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (b)             | The probability mass function of a variate $X$ is given below: <table><tr><td><math>x</math></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td><math>f</math></td><td>0</td><td><math>k</math></td><td><math>2k</math></td><td><math>2k</math></td><td><math>3k</math></td><td><math>k^2</math></td><td><math>2k^2</math></td><td><math>7k^2+k</math></td></tr></table> Determine i) $k$ ii) mean iii) $P(X < 4)$ , $P(3 < x < 6)$ . | $x$             | 0    | 1    | 2    | 3     | 4      | 5        | 6   | 7   | $f$ | 0   | $k$            | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ | $7k^2+k$ | 5M | CO3 | L3 |   |    |     |    |
| $x$             | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1               | 2    | 3    | 4    | 5     | 6      | 7        |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| $f$             | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $k$             | $2k$ | $2k$ | $3k$ | $k^2$ | $2k^2$ | $7k^2+k$ |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (OR)            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      |      |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| 7(a)            | Two dice are thrown five times. Find the probability of getting 7 as sum (i) at least once (ii) exactly two times.                                                                                                                                                                                                                                                                                                                                                                  | 5M              | CO3  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (b)             | For a normally distributed variate 'x' with mean 1 and standard deviation 3, find the probabilities that (i) $3.43 \leq x \leq 6.19$ (ii) $-1.43 \leq x \leq 6.19$                                                                                                                                                                                                                                                                                                                  | 5M              | CO3  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| 8.              | A population consists of six numbers 5, 10, 14, 18, 13, 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find (i) the mean of the population (ii) the standard deviation of the population (iii) the mean of the sampling distribution of means (iv) the standard deviation of the sampling distribution of means.(i.e., the standard error of mean).                                                                     | 10M             | CO4  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (OR)            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      |      |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| 9(a)            | A random sample of size 36 is taken from an infinite population having the mean 22.4 and the standard deviation 0.048. What is the probability that $\bar{x}$ will be between 22.39 and 22.41.                                                                                                                                                                                                                                                                                      | 5M              | CO4  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (b)             | A random sample of size 81 is taken from a population with standard deviation 0.9. Given that the sample mean is 2.08, construct a 95% confidence interval for the population mean $\mu$ .                                                                                                                                                                                                                                                                                          | 5M              | CO4  | L3   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| 10(a)           | A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population.                                                                                                                                                                                                                                          | 5M              | CO5  | L4   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (b)             | The Blood pressure of 5 women before and after intake of a certain drug are given below: <table><tr><td>Before</td><td>110</td><td>120</td><td>125</td><td>132</td><td>125</td></tr><tr><td>After</td><td>120</td><td>118</td><td>125</td><td>136</td><td>121</td></tr></table> Test whether there is significant change in Blood Pressure at 1% level of significance.                                                                                                             | Before          | 110  | 120  | 125  | 132   | 125    | After    | 120 | 118 | 125 | 136 | 121            | 5M   | CO5  | L4   |       |        |          |    |     |    |   |    |     |    |
| Before          | 110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 120             | 125  | 132  | 125  |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| After           | 120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 118             | 125  | 136  | 121  |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (OR)            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      |      |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| 11(a)           | Marks obtained in Mathematics by 10 students before and after an intensive coaching are given below <table><tr><td>Before coaching</td><td>12</td><td>14</td><td>11</td><td>8</td><td>7</td><td>10</td><td>3</td><td>0</td><td>5</td><td>6</td></tr><tr><td>After coaching</td><td>15</td><td>16</td><td>10</td><td>7</td><td>5</td><td>12</td><td>10</td><td>2</td><td>3</td><td>8</td></tr></table> Test at 0.01 level of significance, whether the intensive coaching is useful. | Before coaching | 12   | 14   | 11   | 8     | 7      | 10       | 3   | 0   | 5   | 6   | After coaching | 15   | 16   | 10   | 7     | 5      | 12       | 10 | 2   | 3  | 8 | 5M | CO5 | L4 |
| Before coaching | 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 14              | 11   | 8    | 7    | 10    | 3      | 0        | 5   | 6   |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| After coaching  | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 16              | 10   | 7    | 5    | 12    | 10     | 2        | 3   | 8   |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |
| (b)             | It is known that the mean diameters of rivets produced by two firms A and B are practically the same, but the standard deviations may differ. For 22 rivets produced by firm A ,the S.D is 2.9mm, while for 16 rivets manufactured by firm B, the S.D is 3.8 mm. Compute the statistic you would use to test whether the products of firm A have the same variability as those of firm B and test its significance.                                                                 | 5M              | CO5  | L4   |      |       |        |          |     |     |     |     |                |      |      |      |       |        |          |    |     |    |   |    |     |    |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CE04-ENGINEERING GEOLOGY**

(CE)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                  | Marks        | CO        | BL        |
|-------------|------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|
| 1(a)        | What are the major branches of geology?                                                              | 2M           | CO1       | L1        |
| (b)         | What are the different types of weathering processes?                                                | 2M           | CO1       | L1        |
| (c)         | What are the physical properties of quartz?                                                          | 2M           | CO2       | L1        |
| (d)         | Define igneous rocks and give an example.                                                            | 2M           | CO2       | L2        |
| (e)         | Define strike and dip in geological structures.                                                      | 2M           | CO3       | L1        |
| (f)         | What are the different types of joints found in rock formations?                                     | 2M           | CO3       | L1        |
| (g)         | What is the cone of depression in groundwater studies?                                               | 2M           | CO4       | L1        |
| (h)         | How are seismic waves classified?                                                                    | 2M           | CO3       | L1        |
| (i)         | What are the geological considerations for selecting a dam site?                                     | 2M           | CO4       | L1        |
| (j)         | Define tunneling and state its purpose.                                                              | 2M           | CO4       | L1        |
| <b>Q.No</b> | <b>All questions carry equal marks</b>                                                               | <b>Marks</b> | <b>CO</b> | <b>BL</b> |
| 2(a)        | Explain the role of geological agents in shaping the Earth's surface with examples.                  | 5M           | CO1       | L2        |
| (b)         | How does the geological work of rivers as a geological agent ?                                       | 5M           | CO1       | L2        |
| <b>(OR)</b> |                                                                                                      |              |           |           |
| 3(a)        | Explain how geological formations affect infrastructure development.                                 | 5M           | CO1       | L2        |
| (b)         | Differentiate between weathering and erosion.                                                        | 5M           | CO1       | L2        |
| 4.          | Describe different types of minerals found in rock formations and their significance.                | 10M          | CO2       | L2        |
| <b>(OR)</b> |                                                                                                      |              |           |           |
| 5(a)        | Compare characteristics of metamorphic rocks and igneous rocks.                                      | 5M           | CO2       | L2        |
| (b)         | Describe the engineering significance of laterite and limestone in construction.                     | 5M           | CO2       | L2        |
| 6(a)        | Explain the classification and formation of folds in geological structures.                          | 5M           | CO3       | L2        |
| (b)         | Discuss the role of joints in rock formations and their impact on stability.                         | 5M           | CO3       | L2        |
| <b>(OR)</b> |                                                                                                      |              |           |           |
| 7(a)        | Describe different types of unconformities and their geological importance.                          | 5M           | CO3       | L2        |
| (b)         | How do geological structures affect the safety and stability of civil engineering structures?        | 5M           | CO3       | L2        |
| 8(a)        | Explain the factors affecting groundwater movement and its impact on infrastructure.                 | 5M           | CO3       | L2        |
| (b)         | Explain the significance of the Richter scale in earthquake intensity measurement.                   | 5M           | CO4       | L2        |
| <b>(OR)</b> |                                                                                                      |              |           |           |
| 9(a)        | Describe the causes and effects of earthquakes on civil structures.                                  | 5M           | CO3       | L2        |
| (b)         | Discuss different geophysical methods.                                                               | 5M           | CO4       | L2        |
| 10.         | How do a dam and a reservoir differ in function? Explain their interdependence and the significance. | 10M          | CO3       | L2        |
| <b>(OR)</b> |                                                                                                      |              |           |           |
| 11(a)       | How does geology influence reservoir construction and maintenance?                                   | 5M           | CO4       | L2        |
| (b)         | Discuss the influence of geology on successful tunneling projects.                                   | 5M           | CO3       | L2        |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING(AUTONOMOUS)**

L.B.ReddyNagar :: Mylavaram – 521 230 :: NTR Dist.: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23FE10-PROBABILITY & STATISTICS**

(CSE,CSE(AI&amp;ML) and IT)

Time : 3 hours

Max. Marks : 70

R2300P  
6/5/26

| Q.No | Compulsory Question                                                                                                                                                                                                            |       |       |       |       |       | Marks | CO  | BL |        |     |    |   |   |   |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-----|----|--------|-----|----|---|---|---|
| 1(a) | Define Population and Sample.                                                                                                                                                                                                  |       |       |       |       |       | 2M    | CO1 | L1 |        |     |    |   |   |   |
| (b)  | Calculate the mean deviation about mean from the data 6,7,10,12,13,4,12,16.                                                                                                                                                    |       |       |       |       |       | 2M    | CO1 | L2 |        |     |    |   |   |   |
| (c)  | Write Normal equations to calculate the constants in a Straight equation using least square method.                                                                                                                            |       |       |       |       |       | 2M    | CO2 | L1 |        |     |    |   |   |   |
| (d)  | If $\sum xy = 3200$ and $\sum x^2 = 175000$ , $\sum y^2 = 60$ then calculate the correlation between $x$ and $y$ Where $x = x_i - \bar{x}$ ; $y = y_i - \bar{y}$ .                                                             |       |       |       |       |       | 2M    | CO2 | L2 |        |     |    |   |   |   |
| (e)  | In a Binomial distribution the mean and variance are given as 4 and 3 respectively. Find $n$ , $p$ of the distribution.                                                                                                        |       |       |       |       |       | 2M    | CO3 | L2 |        |     |    |   |   |   |
| (f)  | Define the Poisson distribution.                                                                                                                                                                                               |       |       |       |       |       | 2M    | CO3 | L1 |        |     |    |   |   |   |
| (g)  | Find the value of finite population correction factor for $n = 10$ and $N=100$ .                                                                                                                                               |       |       |       |       |       | 2M    | CO4 | L2 |        |     |    |   |   |   |
| (h)  | A researcher selects a random sample of 100 observations from a population with a standard deviation of 30. Determine the standard error of the sample mean.                                                                   |       |       |       |       |       | 2M    | CO4 | L2 |        |     |    |   |   |   |
| (i)  | Write types of errors in testing of hypothesis.                                                                                                                                                                                |       |       |       |       |       | 2M    | CO5 | L1 |        |     |    |   |   |   |
| (j)  | If $\bar{x} = 20$ , $\mu = 16$ , $\sigma = 4$ and $n = 36$ , then calculate the test statistic $Z$ .                                                                                                                           |       |       |       |       |       | 2M    | CO5 | L2 |        |     |    |   |   |   |
| Q.No | All questions carry equal marks                                                                                                                                                                                                |       |       |       |       |       | Marks | CO  | BL |        |     |    |   |   |   |
| 2.   | Evaluate mean ,median,mode of the following data                                                                                                                                                                               |       |       |       |       |       | 10M   | CO1 | L3 |        |     |    |   |   |   |
|      | Marks                                                                                                                                                                                                                          | 10-25 | 25-40 | 40-55 | 55-70 | 70-85 |       |     |    | 85-100 |     |    |   |   |   |
|      | Frequency                                                                                                                                                                                                                      | 6     | 20    | 44    | 26    | 3     |       |     |    | 1      |     |    |   |   |   |
| (OR) |                                                                                                                                                                                                                                |       |       |       |       |       |       |     |    |        |     |    |   |   |   |
| 3(a) | Explain Various charts in Data Visualization.                                                                                                                                                                                  |       |       |       |       |       | 5M    | CO1 | L2 |        |     |    |   |   |   |
| (b)  | Find the range, variance, and standard deviation of the following data 45,60,62,60,50,65,58,68,44,48.                                                                                                                          |       |       |       |       |       | 5M    | CO1 | L3 |        |     |    |   |   |   |
| 4(a) | Evaluate the rank correlation coefficient between the rankings of 10 students in accordance with their performance in two subjects Mathematics and Computer science given in the following table.                              |       |       |       |       |       | 5M    | CO2 | L3 |        |     |    |   |   |   |
|      | Rank in Mathematics                                                                                                                                                                                                            |       | 6     | 5     | 3     | 10    |       |     |    | 2      | 4   | 9  | 7 | 8 | 1 |
|      | Rank in Computer science                                                                                                                                                                                                       |       | 3     | 8     | 4     | 9     |       |     |    | 1      | 6   | 10 | 7 | 5 | 2 |
| (b)  | Construct a straight line from the following data by the method of least squares                                                                                                                                               |       |       |       |       |       | 5M    | CO2 | L3 |        |     |    |   |   |   |
|      | X                                                                                                                                                                                                                              | 0     | 1     | 2     | 3     | 4     |       |     |    |        |     |    |   |   |   |
|      | Y                                                                                                                                                                                                                              | 1     | 1.8   | 3.3   | 4.5   | 6.3   |       |     |    |        |     |    |   |   |   |
| (OR) |                                                                                                                                                                                                                                |       |       |       |       |       |       |     |    |        |     |    |   |   |   |
| 5(a) | The regression equations of two variables $X$ and $Y$ are $3X + 2Y - 26 = 0$ and $6X + Y - 31 = 0$ . Find (i)Mean values of $X$ and $Y$ (ii)Two regression coefficients (iii) Coefficient of correlation between $X$ and $Y$ . |       |       |       |       |       | 5M    | CO2 | L3 |        |     |    |   |   |   |
| (b)  | Fit a parabola of the form $y = a + bx + cx^2$ to the following data.                                                                                                                                                          |       |       |       |       |       | 5M    | CO2 | L3 |        |     |    |   |   |   |
|      | x                                                                                                                                                                                                                              | 1.0   | 1.5   | 2.0   | 2.5   | 3.0   |       |     |    | 3.5    | 4.0 |    |   |   |   |
|      | y                                                                                                                                                                                                                              | 1.1   | 1.3   | 1.6   | 2.0   | 2.7   |       |     |    | 3.4    | 4.1 |    |   |   |   |

## 23FE10-PROBABILITY & STATISTICS

|        |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |     |     |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|-----|-----|-----|-----|-------|------|-----|-----|-----|-----|-----|-----|----|-----|----|
| 6(a)   | Of the three men, the chances that a politician, a business man or an academician will be appointed as a vice-chancellor (V.C) of a university are 0.5, 0.3, and 0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C is 0.3, 0.7, and 0.8 respectively.<br>(i) Determine the probability that research is promoted<br>(ii) If research is promoted, what is the probability that V.C is an academician. | 5M     | CO3 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (b)    | A random variable X has the following probability mass function<br><table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(x)</td><td>0.1</td><td>k</td><td>0.2</td><td>2k</td><td>0.3</td><td>k</td></tr></table><br>Then find the value of k, mean and variance of X.                                                                                                                                         | x      | -2  | -1  | 0   | 1   | 2   | 3     | P(x) | 0.1 | k   | 0.2 | 2k  | 0.3 | k   | 5M | CO3 | L3 |
| x      | -2                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -1     | 0   | 1   | 2   | 3   |     |       |      |     |     |     |     |     |     |    |     |    |
| P(x)   | 0.1                                                                                                                                                                                                                                                                                                                                                                                                                                                       | k      | 0.2 | 2k  | 0.3 | k   |     |       |      |     |     |     |     |     |     |    |     |    |
| (OR)   |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |     |     |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| 7(a)   | A die is thrown 6 times .If getting an even number is a success,find the probabilities of (i) at least one Success (ii) 4 Successes.                                                                                                                                                                                                                                                                                                                      | 5M     | CO3 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (b)    | For a normally distributed variate 'x' with mean 30 and standard deviation 5, find the probabilities that<br>(i) $P(26 \leq X \leq 40)$ (ii) $p(X \geq 45)$ .                                                                                                                                                                                                                                                                                             | 5M     | CO3 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| 8.     | A population consists of five numbers 2, 4, 6, 8 and 10. Consider all possible samples of size two which can be drawn without replacement from this population. Find (i) mean of the population (ii) standard deviation of the population (iii) mean of the sampling distribution of means (iv) standard deviation of the sampling distribution of means.                                                                                                 | 10M    | CO4 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (OR)   |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |     |     |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| 9(a)   | A random sample of size 64 is taken from an infinite population having the mean 45 and the standard deviation 8. What is the probability that $\bar{x}$ will be between 46 and 47.5.                                                                                                                                                                                                                                                                      | 5M     | CO4 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (b)    | A Random sample of size 81 was taken whose variance is 20.25 and mean is 32, construct 98% confidence interval for the true mean.                                                                                                                                                                                                                                                                                                                         | 5M     | CO4 | L3  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| 10(a)  | An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes .Test the claim at 0.05 level of significance.                                                                                                                                                                                                    | 5M     | CO5 | L4  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (b)    | The number of automobile accidents per week in a certain community is as follows: 12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that the accident conditions were the same during this 10 week period using Chi – square test.                                                                                                                                                                                    | 5M     | CO5 | L4  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (OR)   |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |     |     |     |     |     |       |      |     |     |     |     |     |     |    |     |    |
| 11(a)  | The Blood pressure of 5 women before and after intake of a certain drug are given below:<br><table><tr><td>Before</td><td>110</td><td>120</td><td>125</td><td>132</td><td>125</td></tr><tr><td>After</td><td>120</td><td>118</td><td>125</td><td>136</td><td>121</td></tr></table><br>Test whether there is significant change in Blood Pressure at 1% level of significance.                                                                             | Before | 110 | 120 | 125 | 132 | 125 | After | 120  | 118 | 125 | 136 | 121 | 5M  | CO5 | L4 |     |    |
| Before | 110                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 120    | 125 | 132 | 125 |     |     |       |      |     |     |     |     |     |     |    |     |    |
| After  | 120                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 118    | 125 | 136 | 121 |     |     |       |      |     |     |     |     |     |     |    |     |    |
| (b)    | The mean weekly sales of soap bars in departmental stores were 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a standard deviation of 17.2. Was the advertising campaign successful? (Test at 0.05 level of significance).                                                                                                                                       | 5M     | CO5 | L4  |     |     |     |       |      |     |     |     |     |     |     |    |     |    |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

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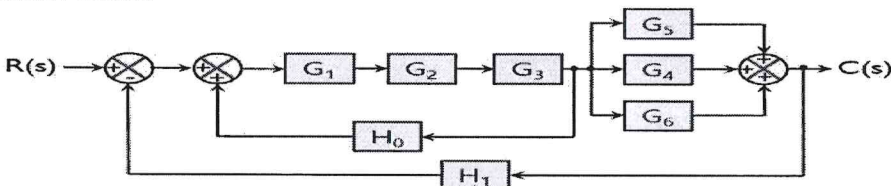
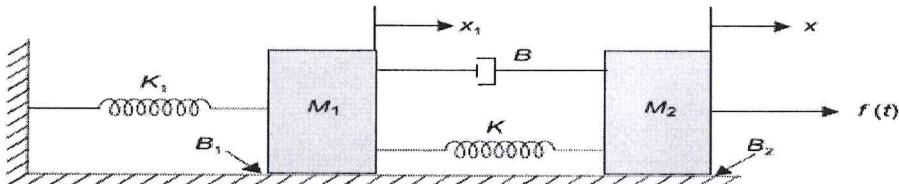
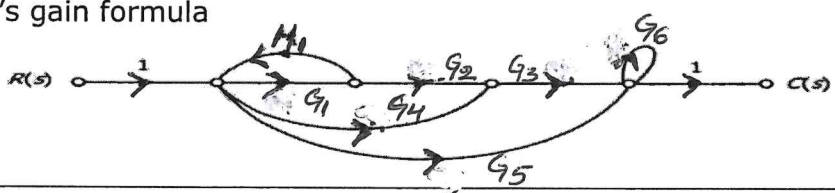
B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EE09-CONTROL SYSTEMS**

(ECE &amp; EEE)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                                                                   | Marks | CO  | BL |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Write the effect of feedback on sensitivity of the system.                                                                                                                            | 2M    | CO1 | L2 |
| (b)         | List the real-time examples for closed loop system.                                                                                                                                   | 2M    | CO1 | L2 |
| (c)         | Draw the response of the first order system for a unit step input.                                                                                                                    | 2M    | CO2 | L2 |
| (d)         | Determine the order and type of the following system<br>$G(s)H(s) = \frac{K}{s^2(s+2)(s+3)}$                                                                                          | 2M    | CO2 | L2 |
| (e)         | Draw the pole-zero plot for the given open loop transfer function,<br>$G(s) = \frac{s^2 + 7s + 10}{s(s+2)(s+4)}$                                                                      | 2M    | CO3 | L2 |
| (f)         | Determine the characteristic equation for the system<br>$G(s)H(s) = \frac{K(s+1)}{(s+2)(s+4)}$                                                                                        | 2M    | CO3 | L2 |
| (g)         | Define Gain Margin and Phase Margin.                                                                                                                                                  | 2M    | CO4 | L2 |
| (h)         | Draw the Polar plot for $G(s) = \frac{1}{1+sT}$                                                                                                                                       | 2M    | CO4 | L2 |
| (i)         | Write homogeneous solution of state equation.                                                                                                                                         | 2M    | CO5 | L2 |
| (j)         | What are the state variables in a series RLC circuit?                                                                                                                                 | 2M    | CO5 | L2 |
| Q.No        | All questions carry equal marks                                                                                                                                                       | Marks | CO  | BL |
| 2(a)        | Discuss the operation of closed loop system with its advantages and disadvantages.                                                                                                    | 5 M   | CO1 | L2 |
| (b)         | Determine the transfer function of the following block diagram using reduction rules.<br>         | 5 M   | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                       |       |     |    |
| 3(a)        | Write the differential and Laplace equations for the following mechanical system<br>              | 5 M   | CO1 | L3 |
| (b)         | Determine the transfer function of the following signal flow graph using Mason's gain formula<br> | 5 M   | CO1 | L3 |
| 4(a)        | Derive the response of second order undamped system for unit step input.                                                                                                              | 5M    | CO2 | L3 |

|       |                                                                                                                                                                                                                                                                |     |     |    |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| (b)   | A unity feedback control system has an open loop transfer function<br>$G(s) = \frac{10}{s(s+2)}$<br>Determine the rise time, peak time and settling time.                                                                                                      | 5M  | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 5(a)  | The unity feedback is characterized by an open loop transfer function<br>$G(s) = \frac{K}{s(s+5)}$<br>Determine the gain K so that the system will have the damping ratio of 0.8 for this value of K. Determine the peak overshoot for a unit step input.      | 5M  | CO2 | L3 |
| (b)   | For a unity feedback system whose open loop transfer function is given by,<br>$G(s) = \frac{50(s+2)}{s(s+10)(s+50)}$<br>Determine i) Error coefficients ii) steady state error.                                                                                | 5M  | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 6(a)  | Construct the Routh array and determine stability of system represented by the characteristic equation<br>$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$                                                                                                   | 5M  | CO3 | L3 |
| (b)   | The open loop transfer function of a unity feedback control system is given by<br>$G(s) = \frac{K(s+1)}{(s+5)(s+10)}$<br>Determine the maximum value of 'K' for the stability of the closed loop system.                                                       | 5M  | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 7.    | Draw the root locus for the system whose open loop transfer function is<br>$G(s)H(s) = \frac{K(s+12)}{s^2(s+20)}$                                                                                                                                              | 10M | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 8.    | Draw the Bode plot for a control system having transfer function,<br>$G(s) = \frac{100}{s(s+1)(s+2)}$<br>Determine the following from the Bode plot:<br>(i) Gain margin; (ii) Phase margin; (iii) Gain crossover frequency and (iv) Phase crossover frequency. | 10M | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 9.    | Draw the Nyquist plot and comment on stability for the system<br>$G(s) = \frac{1}{s(1+s)(1+2s)}$                                                                                                                                                               | 10M | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 10(a) | Obtain the state model in diagonal canonical form for the following transfer function<br>$\frac{Y(s)}{U(s)} = \frac{2(s+5)}{s^3 + 9s^2 + 26s + 24}$                                                                                                            | 5M  | CO5 | L3 |
| (b)   | Determine the transfer function for the following state model<br>$A = \begin{bmatrix} -2 & 1 \\ 0 & -3 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and } C = [1 \quad 1]$                                                                   | 5M  | CO5 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                |     |     |    |
| 11(a) | Determine the state transition matrix for the system $\dot{X} = AX + BU$ with<br>$A = \begin{bmatrix} 0 & 1 \\ -5 & -6 \end{bmatrix}$                                                                                                                          | 5M  | CO5 | L3 |
| (b)   | Test the controllability and observability of the system described by<br>$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ -2 \end{bmatrix} \text{ and } C = [1 \quad 2]$                                                          | 5M  | CO5 | L3 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AD02-ARTIFICIAL INTELLIGENCE**

(AI&amp;DS)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                       | Marks | CO  | BL |
|-------------|---------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Write Natural Intelligence Advantages over Artificial Intelligence.       | 2M    | CO1 | L1 |
| (b)         | What is an Artificial Agent?                                              | 2M    | CO1 | L2 |
| (c)         | Define Heuristics.                                                        | 2M    | CO2 | L2 |
| (d)         | Define Adversarial search.                                                | 2M    | CO2 | L2 |
| (e)         | Define Inheritance.                                                       | 2M    | CO3 | L2 |
| (f)         | What is uncertainty?                                                      | 2M    | CO3 | L2 |
| (g)         | Write the first order logic for "Marcus assassinated Caesar".             | 2M    | CO4 | L2 |
| (h)         | What are the different forms of learning in AI?                           | 2M    | CO4 | L2 |
| (i)         | Define XCON.                                                              | 2M    | CO5 | L2 |
| (j)         | Define a knowledgebase.                                                   | 2M    | CO5 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| Q.No        | All questions carry equal marks                                           | Marks | CO  | BL |
| 2(a)        | Explain about the structure of agents.                                    | 5M    | CO1 | L2 |
| (b)         | What are AI Objectives and discuss Signs of Intelligence?                 | 5M    | CO1 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 3(a)        | How Artificial Intelligence differs from Conventional computing?          | 5M    | CO1 | L2 |
| (b)         | Explain in detail the nature of environment.                              | 5M    | CO1 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 4.          | Explain how A* search technique is implemented with an example.           | 10M   | CO2 | L3 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 5(a)        | Explain about Uninformed search strategies.                               | 5M    | CO2 | L2 |
| (b)         | Explain Heuristics for state space search.                                | 5M    | CO2 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 6(a)        | How back tracking is useful in constraint satisfaction problem explain?   | 5M    | CO3 | L4 |
| (b)         | Explain Rule based Deduction systems in detail.                           | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 7(a)        | Explain different knowledge representation techniques in expert systems.  | 5M    | CO3 | L2 |
| (b)         | Compare Bayes' theorem and Dempster-Shafer theory in uncertain reasoning. | 5M    | CO3 | L4 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 8(a)        | Explain Decision Tree Pruning.                                            | 5M    | CO4 | L2 |
| (b)         | Explain about statistical learning.                                       | 5M    | CO4 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 9.          | What is backward chaining? Explain.                                       | 10M   | CO4 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 10(a)       | Write the working of DART and its significance.                           | 5M    | CO5 | L2 |
| (b)         | Describe the Expert System Shells importance in AI development.           | 5M    | CO5 | L2 |
| <b>(OR)</b> |                                                                           |       |     |    |
| 11(a)       | Explain Expert system shells in detail.                                   | 5M    | CO5 | L2 |
| (b)         | Explain different roles of an Expert System.                              | 5M    | CO5 | L2 |

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B.Tech. (IV Semester) Regular Examinations

**23AE04-MATERIALS AND MANUFACTURING TECHNOLOGY**  
(ASE)

Time : 3 hours

Max. Marks : 70

*23/05/26*

| Q.No        | Compulsory Question                                                                                                                                                                                     | Marks | CO  | BL |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Calculate the lattice constant for FCC crystal having atomic radius 1.476 <sup>o</sup> A.                                                                                                               | 2M    | CO1 | L2 |
| (b)         | What is polymorphism?                                                                                                                                                                                   | 2M    | CO1 | L2 |
| (c)         | What is Eutectoid Reaction? Write an example of the eutectoid reaction occurring in the Iron Carbon System.                                                                                             | 2M    | CO2 | L1 |
| (d)         | Why does the aluminium replace the copper as an electrical conductor?                                                                                                                                   | 2M    | CO2 | L2 |
| (e)         | Define pattern. List the allowances of pattern.                                                                                                                                                         | 2M    | CO3 | L1 |
| (f)         | Suggest a casting method for making metal components of thin sections with high dimensional accuracy and good surface finish.                                                                           | 2M    | CO3 | L2 |
| (g)         | What is the purpose of flux? Why is it not needed in gas tungsten-arc welding?                                                                                                                          | 2M    | CO4 | L1 |
| (h)         | Propose a method for a company that aims at mass producing screws and bolts.                                                                                                                            | 2M    | CO4 | L2 |
| (i)         | What are the factors influencing in the selection of cutting speeds and feeds for a machining operation?                                                                                                | 2M    | CO5 | L1 |
| (j)         | What are the main parameters to be considered while selecting a particular unconventional machining process?                                                                                            | 2M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| Q.No        | All questions carry equal marks                                                                                                                                                                         | Marks | CO  | BL |
| 2(a)        | Illustrate the arrangement of atoms in a Hexagonal unit cell.                                                                                                                                           | 5M    | CO1 | L3 |
| (b)         | Determine coordination number, atomic radius and packing density of HCP system.                                                                                                                         | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| 3.          | Explain the effect of grain boundaries on the properties of metal and alloys.                                                                                                                           | 10M   | CO1 | L2 |
| 4.          | Draw Iron-Iron carbide equilibrium diagram and mark on it all salient temperatures and composition fields.                                                                                              | 10M   | CO2 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| 5.          | Compare gray and malleable cast irons with respect to (i) composition and heat treatment (ii) microstructure (iii) mechanical characteristics (iv) applications.                                        | 10M   | CO2 | L2 |
| 6.          | Identify 6 various components of domestic appliances and describe the type of moulding process used for manufacturing them.                                                                             | 10M   | CO3 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| 7.          | Describe how nozzles for gas turbine can be manufactured using investment casting and explain the steps involved with neat sketch.                                                                      | 10M   | CO3 | L2 |
| 8.          | Explain the process of friction stir welding with a neat diagram and the various applications and performance of such welded components.                                                                | 10M   | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| 9(a)        | Classify and sketch the various rolling mills.                                                                                                                                                          | 5M    | CO4 | L2 |
| (b)         | Explain the principle involving in each rolling mill.                                                                                                                                                   | 5M    | CO4 | L2 |
| 10(a)       | Discuss the different types of tool wear that occur during machining operations and discuss how each type of wear affects tool life, the quality of the machined surface, and the dimensional accuracy. | 5M    | CO5 | L2 |
| (b)         | How are helical gears manufactured for use in automobile gear trains, considering their smooth operation and high load-carrying capacity?                                                               | 5M    | CO5 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                         |       |     |    |
| 11.         | Illustrate the ultrasonic machining process used for machining hard and brittle materials and provide a neat sketch to illustrate the process.                                                          | 10M   | CO5 | L2 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CE05-CONCRETE TECHNOLOGY**

(CE)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                 | Marks | CO  | BL |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | What do you mean by graded aggregate?                                                                                                                                                                                                                                                                                                                                               | 2M    | CO1 | L1 |
| (b)   | What is meant by 53 grade cement?                                                                                                                                                                                                                                                                                                                                                   | 2M    | CO1 | L1 |
| (c)   | Explain the uses of ready mix concrete.                                                                                                                                                                                                                                                                                                                                             | 2M    | CO2 | L2 |
| (d)   | What is meant by Shotcrete?                                                                                                                                                                                                                                                                                                                                                         | 2M    | CO2 | L1 |
| (e)   | Define gel space ratio.                                                                                                                                                                                                                                                                                                                                                             | 2M    | CO3 | L1 |
| (f)   | What are the uses of NDT?                                                                                                                                                                                                                                                                                                                                                           | 2M    | CO3 | L1 |
| (g)   | What is Poisson's ratio?                                                                                                                                                                                                                                                                                                                                                            | 2M    | CO4 | L1 |
| (h)   | What is Dynamic modulus of elasticity?                                                                                                                                                                                                                                                                                                                                              | 2M    | CO4 | L1 |
| (i)   | List out the factors in the choice of mix proportions.                                                                                                                                                                                                                                                                                                                              | 2M    | CO5 | L1 |
| (j)   | Explain the uses of Fibre reinforced concrete.                                                                                                                                                                                                                                                                                                                                      | 2M    | CO5 | L2 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                     | Marks | CO  | BL |
| 2(a)  | Discuss the role of mineral admixtures in concrete.                                                                                                                                                                                                                                                                                                                                 | 5M    | CO1 | L2 |
| (b)   | Write about the classification of aggregates.                                                                                                                                                                                                                                                                                                                                       | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                     |       |     |    |
| 3(a)  | What are the mechanical and physical properties of Fine aggregates?                                                                                                                                                                                                                                                                                                                 | 5M    | CO1 | L1 |
| (b)   | Write the chemical composition limits of ordinary Portland cement.                                                                                                                                                                                                                                                                                                                  | 5M    | CO1 | L1 |
| 4(a)  | Define workability. What are the various factors which effect the workability of concrete?                                                                                                                                                                                                                                                                                          | 5M    | CO2 | L1 |
| (b)   | Discuss in detail about segregation and bleeding.                                                                                                                                                                                                                                                                                                                                   | 5M    | CO2 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                     |       |     |    |
| 5(a)  | Explain the process of transporting and placing in the manufacturing of concrete with neat sketches.                                                                                                                                                                                                                                                                                | 5M    | CO2 | L2 |
| (b)   | Write about mixing and vibration of concrete.                                                                                                                                                                                                                                                                                                                                       | 5M    | CO2 | L2 |
| 6(a)  | Explain various factors affecting performance of hardened concrete in detail.                                                                                                                                                                                                                                                                                                       | 5M    | CO3 | L2 |
| (b)   | Discuss the relation between compressive strength and tensile strength of concrete?                                                                                                                                                                                                                                                                                                 | 5M    | CO3 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                     |       |     |    |
| 7(a)  | Explain in detail about nondestructive testing of concrete.                                                                                                                                                                                                                                                                                                                         | 5M    | CO3 | L2 |
| (b)   | Write a brief note on compressive strength of Concrete.                                                                                                                                                                                                                                                                                                                             | 5M    | CO3 | L2 |
| 8(a)  | Write a short note on poisson's ratio and explain the procedure to determine poisson's ratio.                                                                                                                                                                                                                                                                                       | 5M    | CO4 | L2 |
| (b)   | What is shrinkage of concrete? Explain about classification of shrinkage.                                                                                                                                                                                                                                                                                                           | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                     |       |     |    |
| 9(a)  | Write the factors effecting the modulus of elasticity.                                                                                                                                                                                                                                                                                                                              | 5M    | CO4 | L2 |
| (b)   | Define creep? Explain the Factors effecting the creep.                                                                                                                                                                                                                                                                                                                              | 5M    | CO4 | L2 |
| 10.   | Design M30 grade concrete for the following data<br>Maximum size of C.A = 20mm (angular)<br>Grade of cement = 53<br>workability = 75 mm slump<br>Type of exposure = moderate<br>Specific gravity of cement = 3.15<br>Specific gravity of C.A = 2.75<br>Specific gravity of F.A = 2.6<br>Water absorption of CA = 1%<br>Water absorption of FA = 2%<br>Sand is conforming to zone II | 10M   | CO5 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                     |       |     |    |
| 11(a) | Explain about the Self Consolidating Concrete.                                                                                                                                                                                                                                                                                                                                      | 5M    | CO5 | L2 |
| (b)   | Write a short note on High Performance Concrete.                                                                                                                                                                                                                                                                                                                                    | 5M    | CO5 | L2 |



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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CS06-OPERATING SYSTEMS**

(CSE&IT)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                                                                                                                                                                          | Marks | CO  | BL |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Define Operating System. Give any two Services of it.                                                                                                                                                                                                                                        | 2M    | CO1 | L1 |
| (b)         | Differentiate between user mode and kernel mode in an operating system.                                                                                                                                                                                                                      | 2M    | CO1 | L1 |
| (c)         | Discuss about Semaphores.                                                                                                                                                                                                                                                                    | 2M    | CO2 | L1 |
| (d)         | What is Multithreading?                                                                                                                                                                                                                                                                      | 2M    | CO2 | L1 |
| (e)         | Tell about Batch Processing.                                                                                                                                                                                                                                                                 | 2M    | CO3 | L1 |
| (f)         | Define Time Slicing.                                                                                                                                                                                                                                                                         | 2M    | CO3 | L1 |
| (g)         | Discuss Page fault.                                                                                                                                                                                                                                                                          | 2M    | CO4 | L1 |
| (h)         | What is Internal Fragmentation?                                                                                                                                                                                                                                                              | 2M    | CO4 | L1 |
| (i)         | Describe File Mount.                                                                                                                                                                                                                                                                         | 2M    | CO5 | L1 |
| (j)         | Define File System.                                                                                                                                                                                                                                                                          | 2M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| Q.No        | All questions carry equal marks                                                                                                                                                                                                                                                              | Marks | CO  | BL |
| 2(a)        | Explain (i) OS system calls (ii) OS services.                                                                                                                                                                                                                                                | 5M    | CO1 | L2 |
| (b)         | Define Operating system. List the objectives of an operating system.                                                                                                                                                                                                                         | 5M    | CO1 | L1 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| 3(a)        | Explain the structure of any operating system.                                                                                                                                                                                                                                               | 5M    | CO1 | L2 |
| (b)         | With a neat sketch, explain the process state diagram.                                                                                                                                                                                                                                       | 5M    | CO1 | L2 |
| 4(a)        | What is Dining Philosophers problem? Discuss the solution to Dining philosopher's problem using monitors.                                                                                                                                                                                    | 5M    | CO2 | L2 |
| (b)         | What are the requirements of the solution to critical section problem?                                                                                                                                                                                                                       | 5M    | CO2 | L1 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| 5(a)        | Demonstrate about Test and Set instructions in solving critical section problem.                                                                                                                                                                                                             | 5M    | CO2 | L3 |
| (b)         | Describe any two Classical Synchronization problems.                                                                                                                                                                                                                                         | 5M    | CO2 | L2 |
| 6(a)        | Illustrate Deadlock Avoidance with suitable example.                                                                                                                                                                                                                                         | 5M    | CO3 | L3 |
| (b)         | How resource allocation graphs are useful in describing deadlock situation? Explain.                                                                                                                                                                                                         | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| 7(a)        | State and explain four conditions that are necessary for deadlocks to occur with example.                                                                                                                                                                                                    | 5M    | CO3 | L2 |
| (b)         | Write and explain Bankers algorithm for dead lock avoidance.                                                                                                                                                                                                                                 | 5M    | CO3 | L2 |
| 8(a)        | Describe in detail about Swapping technique.                                                                                                                                                                                                                                                 | 5M    | CO4 | L2 |
| (b)         | What is thrashing? How do operating systems can overcome the thrashing? Elaborate on it.                                                                                                                                                                                                     | 5M    | CO4 | L1 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| 9(a)        | Explain Briefly Paging and Segmentation.                                                                                                                                                                                                                                                     | 5M    | CO4 | L2 |
| (b)         | Evaluate the reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 for a memory with three frames. Trace FIFO page replacement algorithm.                                                                                                                             | 5M    | CO4 | L4 |
| 10(a)       | Explain different methods for free space management.                                                                                                                                                                                                                                         | 5M    | CO5 | L2 |
| (b)         | Explain about File Access Methods.                                                                                                                                                                                                                                                           | 5M    | CO5 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                              |       |     |    |
| 11(a)       | Compute the total number of head movements needed to satisfy the following sequence using SSTF and SCAN disk scheduling policies 27,129,110,186,147,41,10,64,120 Assume that the disk head is initially positioned over track 100 and is moving in the direction of decreasing track Number. | 5M    | CO5 | L3 |
| (b)         | Discuss the elements of file management.                                                                                                                                                                                                                                                     | 5M    | CO5 | L2 |



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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AM01-MACHINE LEARNING**  
(CSE(AI&ML))

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                    | Marks | CO  | BL |
|-------------|------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | Define model evaluation.                                                                                               | 2M    | CO1 | L1 |
| (b)         | What is the significance of model training in Machine Learning?                                                        | 2M    | CO1 | L1 |
| (c)         | Define Radius Distance Nearest Neighbor with example.                                                                  | 2M    | CO2 | L1 |
| (d)         | What is KNN regression? What is the impact of choosing different values of 'K' in KNN?                                 | 2M    | CO2 | L1 |
| (e)         | What is multi class classification with example?                                                                       | 2M    | CO3 | L1 |
| (f)         | Define entropy in the context of Decision Trees.                                                                       | 2M    | CO3 | L1 |
| (g)         | What is the Kernel Trick in SVM?                                                                                       | 2M    | CO4 | L1 |
| (h)         | Explain briefly about Logistic Regression.                                                                             | 2M    | CO4 | L2 |
| (i)         | What is data partitioning in clustering?                                                                               | 2M    | CO5 | L1 |
| (j)         | What is a clustering pattern?                                                                                          | 2M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| Q.No        | All questions carry equal marks                                                                                        | Marks | CO  | BL |
| 2(a)        | What are the key stages in Machine Learning? Explain each stage in detail.                                             | 5M    | CO1 | L2 |
| (b)         | Discuss the role of feature engineering in Machine Learning.                                                           | 5M    | CO1 | L2 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 3(a)        | Describe about the importance of data acquisition and preprocessing in Machine Learning.                               | 5M    | CO1 | L2 |
| (b)         | Define overfitting and underfitting in Machine Learning models.                                                        | 5M    | CO1 | L1 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 4.          | Determine how distance measures affect the performance of Nearest Neighbor classifiers.                                | 10M   | CO2 | L3 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 5(a)        | Explain Non-Metric Similarity Functions and their role in Machine Learning.                                            | 5M    | CO2 | L2 |
| (b)         | Discuss the advantages and disadvantages of the KNN classifier.                                                        | 5M    | CO2 | L2 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 6(a)        | Demonstrate the Bias-Variance Tradeoff in Decision Trees.                                                              | 5M    | CO3 | L3 |
| (b)         | Describe the process of constructing a Regression Tree using the CART (Classification and Regression Trees) algorithm. | 5M    | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 7(a)        | Illustrate real-world applications where Random Forest is commonly used for classification and regression problems.    | 5M    | CO3 | L3 |
| (b)         | Determine the assumptions and limitations of the Naïve Bayes Classifier.                                               | 5M    | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 8(a)        | Explain how SVM handles linearly separable and non-linearly separable cases.                                           | 5M    | CO4 | L2 |
| (b)         | What is Backpropagation? Explain its role in training a Multi-Layer Perceptron (MLP).                                  | 5M    | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 9.          | Determine and predict the working of the Perceptron Learning Algorithm with example.                                   | 10M   | CO4 | L3 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 10(a)       | Compare Hard Clustering and Soft Clustering techniques with examples.                                                  | 5M    | CO5 | L2 |
| (b)         | What is the Expectation-Maximization (EM) Algorithm? Explain its role in clustering.                                   | 5M    | CO5 | L2 |
| <b>(OR)</b> |                                                                                                                        |       |     |    |
| 11(a)       | Distinguish between Divisive and Agglomerative Clustering.                                                             | 5M    | CO5 | L2 |
| (b)         | Summarize the limitations of K-Means clustering? How can they be addressed.                                            | 5M    | CO5 | L2 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EC05-ELECTROMAGNETIC WAVES AND TRANSMISSION LINES**  
(ECE)

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                                                                                                                                                                                        | Marks | CO  | BL |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | How does Electric Field Intensity change with distance from a point charge?                                                                                                                                                                                                                | 2M    | CO1 | L1 |
| (b)         | What are the limitations of Gauss's Law?                                                                                                                                                                                                                                                   | 2M    | CO1 | L1 |
| (c)         | State Ampere's Force Law.                                                                                                                                                                                                                                                                  | 2M    | CO1 | L2 |
| (d)         | Define magnetic scalar potential and magnetic vector potential.                                                                                                                                                                                                                            | 2M    | CO1 | L1 |
| (e)         | Define the Brewster angle and explain its significance.                                                                                                                                                                                                                                    | 2M    | CO2 | L2 |
| (f)         | What is the effect of permittivity on wave propagation in a lossless dielectric?                                                                                                                                                                                                           | 2M    | CO2 | L2 |
| (g)         | Explain the characteristics of a lossless transmission line.                                                                                                                                                                                                                               | 2M    | CO3 | L2 |
| (h)         | What are the different types of transmission lines?                                                                                                                                                                                                                                        | 2M    | CO3 | L1 |
| (i)         | What is the significance of the matched transmission line in transmission line analysis?                                                                                                                                                                                                   | 2M    | CO4 | L2 |
| (j)         | How do you calculate the input impedance of a transmission line with a load impedance?                                                                                                                                                                                                     | 2M    | CO4 | L2 |
| Q.No        | All questions carry equal marks                                                                                                                                                                                                                                                            | Marks | CO  | BL |
| 2(a)        | Discuss electric flux and electric flux density using a pair of concentric metallic spheres. Derive the relationship between electric field Intensity (E) and electric flux density (D).                                                                                                   | 5M    | CO1 | L3 |
| (b)         | Evaluate the electric flux density (D) at a point P(2, $\pi/2$ , 0) in the region having potential $V = \frac{10}{r^2} \sin\theta \cos\phi$ . Also calculate the work done in moving a 10 $\mu\text{C}$ charge from point A (1, 30°, 120°) to B (4, 90°, 60°).                             | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                            |       |     |    |
| 3(a)        | Summarize the key points of Poisson's and Laplace's equations, highlighting their significance and applications in electrostatics.                                                                                                                                                         | 5M    | CO1 | L2 |
| (b)         | Evaluate the volume charge density $\rho_v$ and the total charge enclosed by the cylinder of radius 1 m with $-2 \leq z \leq 2$ m at a point P(1, $\pi/4$ , 3). Given that the electric flux density $D = z\rho \cos^2\phi \mathbf{a}_z \text{ C/m}^2$ .                                   | 5M    | CO1 | L3 |
| 4(a)        | State Biot-Savart's law and explain its significance in magnetostatics. Derive the expression for the magnetic field dB due to a small current element.                                                                                                                                    | 5M    | CO1 | L2 |
| (b)         | Apply Maxwell's equations and obtain the Electric field intensity E and the frequency of the wave $\omega$ in a medium characterized by $\sigma = 0$ , $\mu = 2\mu_0$ , $\epsilon = 5\epsilon_0$ if the magnetic field intensity, $H = 2 \cos(\omega t - 3y) \mathbf{a}_z \text{ Amp/m}$ . | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                            |       |     |    |
| 5(a)        | Summarize the key points of inconsistency Ampere's law, and the modification using displacement current density, highlighting the importance of this concept in understanding electromagnetism.                                                                                            | 5M    | CO1 | L2 |
| (b)         | Apply Ampere's circuit law and obtain the magnetic field intensity H at a general point P due to an infinite conductor, which carries a current of 'I' Amps and it is placed on the z-axis. Assume the point P is p distance away from the conductor.                                      | 5M    | CO1 | L3 |



## 23EC05-ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 6(a)  | Analyze the propagation characteristics of an electromagnetic wave through a good conducting medium, considering the following parameters (i) Propagation constant, (ii) Attenuation constant, (iii) Phase constant, (iv) Intrinsic impedance, (v) Electric (E) and magnetic (H) field distributions, (vi) Loss tangent, (vii) Wave velocity, (viii) Wavelength (ix) Skin depth. How do these parameters interact and affect the EM wave's behavior in the good conducting medium? | 5M | CO2 | L3 |
| (b)   | Evaluate $\alpha$ , $\beta$ and H, when a uniform plane wave is propagating in a medium has $E = 2e^{-\alpha z} \sin(10^8 t - \beta z) \mathbf{a}_y \text{ V/m}$ . Assume medium constants, $\epsilon_r = 1$ , $\mu_r = 20$ and $\sigma = 3 \text{ S/m}$ .                                                                                                                                                                                                                         | 5M | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
| 7(a)  | Discuss the phenomenon of reflection and transmission of a plane electromagnetic wave at oblique incidence on a planar interface, considering perpendicular polarization. In your discussion, include: Incident, reflected, and transmitted wave characteristics with diagrams illustrating the wave vectors, polarization, and angles involved. Also Derive reflection ( $\Gamma$ ) and transmission ( $\tau$ ) coefficients.                                                     | 5M | CO2 | L2 |
| (b)   | Evaluate the parameters, Wavelength, Frequency, Dielectric constant, H field, when a plane wave is propagating through a nonmagnetic medium. Given, $E = 50 \sin(10^8 t + 2z) \mathbf{a}_y \text{ V/m}$ .                                                                                                                                                                                                                                                                          | 5M | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
| 8(a)  | Discuss the various parameters associated with a transmission line, including, Series Resistance (R), Series Inductance (L), Shunt Capacitance (C), Shunt Conductance (G), Propagation constant ( $\gamma$ ), Attenuation constant ( $\alpha$ ), Phase constant ( $\beta$ ), Characteristic impedance ( $Z_0$ ).                                                                                                                                                                   | 5M | CO3 | L2 |
| (b)   | An airline has a characteristic impedance of $70 \Omega$ and a phase constant of $3 \text{ rad/m}$ at $100 \text{ MHz}$ . Calculate Inductance per meter and Capacitance per meter of the transmission line.                                                                                                                                                                                                                                                                       | 5M | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
| 9(a)  | Derive and discuss the transmission line equations, which describe the behavior of voltage and current on a transmission line.                                                                                                                                                                                                                                                                                                                                                     | 5M | CO3 | L3 |
| (b)   | Compute the line parameters R, L, G, and C for a distortionless line with $\gamma = 0.04 + j1.5 \text{ m}^{-1}$ , $Z_0 = 80 \Omega$ , $f = 500 \text{ MHz}$ .                                                                                                                                                                                                                                                                                                                      | 5M | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
| 10(a) | Discuss the concepts of voltage reflection coefficient, Voltage Standing Wave Ratio (VSWR), and Average Power, highlighting their relationships and significance in transmission line analysis.                                                                                                                                                                                                                                                                                    | 5M | CO4 | L2 |
| (b)   | Determine the input impedance of a short-circuited transmission line of length, $l = 4 \text{ m}$ , phase constant, $\beta = 2.1 \text{ rad/m}$ , characteristic impedance, $Z_0 = 10 + j15 \Omega$ .                                                                                                                                                                                                                                                                              | 5M | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
| 11(a) | Analyze the constructional aspects and discuss the various applications of the Smith Chart.                                                                                                                                                                                                                                                                                                                                                                                        | 5M | CO4 | L3 |
| (b)   | Evaluate the input impedance of a $2\text{m}$ long transmission line operating at an angular frequency of $10^6 \text{ rad/s}$ , with the parameters: attenuation constant, $\alpha = 0.921 \text{ Np/m}$ , phase constant, $\beta = 1 \text{ rad/m}$ , characteristic impedance, $Z_0 = 60 + j40 \Omega$ , and load impedance, $Z_L = 20 + j50 \Omega$ .                                                                                                                          | 5M | CO4 | L3 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EE06-ANALOG CIRCUITS**

(EEE)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                      | Marks | CO  | BL |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Discuss one application of Clamping Circuit.                                                                                                             | 2M    | CO1 | L1 |
| (b)   | Explain the use of Sensistor in Biasing Circuit.                                                                                                         | 2M    | CO1 | L1 |
| (c)   | Describe the Feedback used in Amplifier Circuits.                                                                                                        | 2M    | CO2 | L2 |
| (d)   | Suggest a Feedback Circuit to improve Input Resistance.                                                                                                  | 2M    | CO2 | L2 |
| (e)   | Write the expression to find the frequency of Wien bridge Oscillator.                                                                                    | 2M    | CO3 | L2 |
| (f)   | Explain the Virtual Ground in Op-Amp.                                                                                                                    | 2M    | CO3 | L2 |
| (g)   | Draw a stable amplifier with 10 mV as nput and 10 V as Output.                                                                                           | 2M    | CO3 | L2 |
| (h)   | Draw the Circuit of Sine Wave Generator.                                                                                                                 | 2M    | CO3 | L2 |
| (i)   | Define Lock-in Range of PLL.                                                                                                                             | 2M    | CO4 | L1 |
| (j)   | Find the Resolution of 10 Bit ADC with Vref=6 Volts.                                                                                                     | 2M    | CO5 | L2 |
| Q.No  | All questions carry equal marks                                                                                                                          | Marks | CO  | BL |
| 2(a)  | Design a collector to base bias circuit to have operating point (10v, 4mA). The circuit is supplied with 20 V and uses a silicon transistor of hfe= 250. | 5M    | CO1 | L3 |
| (b)   | Discuss the function of series diode and shunt diode clipping circuits.                                                                                  | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                          |       |     |    |
| 3(a)  | How can the clipping level be shifted to reference voltage? Explain                                                                                      | 5M    | CO1 | L2 |
| (b)   | Discuss the effect of Operating point shift on Load line.                                                                                                | 5M    | CO1 | L2 |
| 4.    | Describe the h-parameter equivalent circuits for CB, CE AND CC Configurations considering a two port network.                                            | 10M   | CO2 | L2 |
| (OR)  |                                                                                                                                                          |       |     |    |
| 5(a)  | Discuss the effect of Negative Feedback in amplifiers.                                                                                                   | 5M    | CO2 | L2 |
| (b)   | Explain in detail about current series feedback amplifier.                                                                                               | 5M    | CO2 | L2 |
| 6(a)  | Discuss the DC parameters of Op-Amp.                                                                                                                     | 5M    | CO3 | L2 |
| (b)   | summarize the working of R-C phase shift Oscillator.                                                                                                     | 5M    | CO3 | L2 |
| (OR)  |                                                                                                                                                          |       |     |    |
| 7(a)  | Explain the condition for Oscillations.                                                                                                                  | 5M    | CO3 | L2 |
| (b)   | Brief the effect of Slew Rate on AC output.                                                                                                              | 5M    | CO3 | L2 |
| 8(a)  | Describe the working of Triangular Wave Form Generator.                                                                                                  | 5M    | CO3 | L2 |
| (b)   | Design an Adder circuit to add 100, 300 and 500 mV to give an output of 9 Volts.                                                                         | 5M    | CO3 | L3 |
| (OR)  |                                                                                                                                                          |       |     |    |
| 9.    | Summarize the working of (i) V-I Converter and (ii) Integrator.                                                                                          | 10M   | CO3 | L2 |
| 10(a) | Discuss the Specifications of DAC.                                                                                                                       | 5M    | CO5 | L2 |
| (b)   | Explain the working of 555 Timer with its functional Diagram.                                                                                            | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                          |       |     |    |
| 11(a) | What are the advantages of continuous type A/D converter over counter type A/D converter?                                                                | 5M    | CO5 | L3 |
| (b)   | Discuss any one application of PLL.                                                                                                                      | 5M    | CO4 | L2 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23ME06-MANUFACTURING PROCESSES**

(ME)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                  | Marks | CO  | BL |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Why is wood widely used as pattern material?                                                                                                                         | 2M    | CO1 | L1 |
| (b)   | State the function of the core in casting.                                                                                                                           | 2M    | CO1 | L1 |
| (c)   | Define weldability.                                                                                                                                                  | 2M    | CO2 | L1 |
| (d)   | List the advantages of AC equipment over DC equipment in arc Welding.                                                                                                | 2M    | CO2 | L1 |
| (e)   | Distinguish between direct extrusion and indirect extrusion.                                                                                                         | 2M    | CO3 | L1 |
| (f)   | Define angle of bite in rolling.                                                                                                                                     | 2M    | CO3 | L1 |
| (g)   | What is spring back?                                                                                                                                                 | 2M    | CO4 | L1 |
| (h)   | List out the classifications of sheet metal operations.                                                                                                              | 2M    | CO4 | L1 |
| (i)   | List the various post sintering operations adopted in powder metallurgy.                                                                                             | 2M    | CO5 | L1 |
| (j)   | State any four applications of powder metallurgy products in automobiles.                                                                                            | 2M    | CO5 | L1 |
|       |                                                                                                                                                                      |       |     |    |
| Q.No  | All questions carry equal marks                                                                                                                                      | Marks | CO  | BL |
| 2(a)  | Sketch the cross section of a sand mould which is ready for pouring, and label the various important parts.                                                          | 5M    | CO1 | L2 |
| (b)   | Briefly explain the procedure to be followed for making a sand mould.                                                                                                | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                                      |       |     |    |
| 3(a)  | With neat sketch explain centrifugal casting process.                                                                                                                | 5M    | CO1 | L2 |
| (b)   | Show a sketch for a typical gating system, indicating its components.                                                                                                | 5M    | CO1 | L2 |
|       |                                                                                                                                                                      |       |     |    |
| 4(a)  | Discuss the sequence of operations in friction welding.                                                                                                              | 5M    | CO2 | L2 |
| (b)   | Explain the TIG and MIG system of welding with suitable sketches.                                                                                                    | 5M    | CO2 | L2 |
| (OR)  |                                                                                                                                                                      |       |     |    |
| 5(a)  | Discuss about the respective applications of three different types of flames in oxyacetylene gas welding.                                                            | 5M    | CO2 | L2 |
| (b)   | Explain submerged arc welding with a neat sketch. State about the advantages and uses of this process.                                                               | 5M    | CO2 | L2 |
|       |                                                                                                                                                                      |       |     |    |
| 6(a)  | Discuss about typical uses of rolling process; mention names of typical products generally obtained by rolling process and show various sections of rolled products. | 5M    | CO3 | L2 |
| (b)   | With simple sketches describe open die and closed die forging.                                                                                                       | 5M    | CO3 | L2 |
| (OR)  |                                                                                                                                                                      |       |     |    |
| 7(a)  | Define tube piercing and explain it with a neat sketch.                                                                                                              | 5M    | CO3 | L2 |
| (b)   | With neat diagram explain the process of forward extrusion.                                                                                                          | 5M    | CO3 | L2 |
|       |                                                                                                                                                                      |       |     |    |
| 8(a)  | Explain the forming operations in sheet metal operations with a neat sketches.                                                                                       | 5M    | CO4 | L2 |
| (b)   | Explain bending operation and types of bending operations.                                                                                                           | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                                      |       |     |    |
| 9(a)  | With neat diagram explain the process of explosive forming and write its industrial applications.                                                                    | 5M    | CO4 | L2 |
| (b)   | With neat sketches describe the process of electromagnetic forming.                                                                                                  | 5M    | CO4 | L2 |
|       |                                                                                                                                                                      |       |     |    |
| 10(a) | Describe the various steps involved for making a product in powder metallurgy.                                                                                       | 5M    | CO5 | L2 |
| (b)   | Enumerate the variables affecting the sintering process.                                                                                                             | 5M    | CO5 | L2 |
| (OR)  |                                                                                                                                                                      |       |     |    |
| 11(a) | Explain the mechanism of milling for metal powder production.                                                                                                        | 5M    | CO5 | L2 |
| (b)   | Differentiate between the various Mechanical and thermal methods of powder compaction.                                                                               | 5M    | CO5 | L2 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AD03-INTRODUCTION TO DATA SCIENCE**

(AI&amp;DS)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                      | Marks | CO  | BL |
|-------|----------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Define data integration in the context of Data Science.                                                  | 2M    | CO1 | L1 |
| (b)   | List the different facets of data in Data Science.                                                       | 2M    | CO1 | L1 |
| (c)   | What is the purpose of feature engineering in modeling?                                                  | 2M    | CO2 | L2 |
| (d)   | What is the importance of indexing in handling large databases?                                          | 2M    | CO2 | L2 |
| (e)   | Why is NoSQL preferred for handling Big Data?                                                            | 2M    | CO3 | L1 |
| (f)   | Define the CAP theorem in distributed databases.                                                         | 2M    | CO3 | L1 |
| (g)   | What is Cypher in the context of Neo4j?                                                                  | 2M    | CO4 | L1 |
| (h)   | Mention advantages of using SQLite for text data storage.                                                | 2M    | CO4 | L1 |
| (i)   | How does interactive filtering enhance dashboard usability?                                              | 2M    | CO5 | L1 |
| (j)   | What is the significance of model validation in Data Science?                                            | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                          | Marks | CO  | BL |
| 2(a)  | How does Data Science contribute to decision-making in organizations? Provide example.                   | 5M    | CO1 | L3 |
| (b)   | Discuss the role of applications built on Data Science models. Give examples.                            | 5M    | CO1 | L2 |
| (OR)  |                                                                                                          |       |     |    |
| 3(a)  | Discuss the relationship between Big Data and Data Science.                                              | 5M    | CO1 | L3 |
| (b)   | How does Exploratory Data Analysis (EDA) help in understanding data? Provide examples.                   | 5M    | CO1 | L2 |
| 4.    | Discuss the role of Machine Learning in Data Science with suitable examples.                             | 10M   | CO2 | L3 |
| (OR)  |                                                                                                          |       |     |    |
| 5(a)  | Compare supervised, unsupervised, and semi-supervised learning.                                          | 5M    | CO2 | L2 |
| (b)   | Describe case studies of Data Science projects for predicting malicious URLs.                            | 5M    | CO2 | L2 |
| 6(a)  | Explain the architecture and working of the Hadoop framework.                                            | 5M    | CO3 | L3 |
| (b)   | How does the BASE principle provide flexibility in NoSQL databases?                                      | 5M    | CO3 | L3 |
| (OR)  |                                                                                                          |       |     |    |
| 7(a)  | Discuss the NoSQL movement, its benefits, and its impact on Big Data management.                         | 5M    | CO3 | L3 |
| (b)   | Describe the role of Data Science in disease diagnosis and profiling.                                    | 5M    | CO3 | L2 |
| 8(a)  | How does Neo4j handle complex relationships in large datasets?                                           | 5M    | CO4 | L3 |
| (b)   | Explain how topic modeling can be applied to classify Reddit posts.                                      | 5M    | CO4 | L2 |
| (OR)  |                                                                                                          |       |     |    |
| 9.    | Explain in detail how the NLTK library is used for text preprocessing, feature extraction, and analysis. | 10M   | CO4 | L3 |
| 10(a) | Discuss in detail the architecture and working of Crossfilter in interactive data filtering.             | 5M    | CO5 | L2 |
| (b)   | Explain the significance of MapReduce in processing large datasets.                                      | 5M    | CO5 | L3 |
| (OR)  |                                                                                                          |       |     |    |
| 11    | Provide a detailed case study on how the Data Science process was applied to solve a real-world problem. | 10M   | CO5 | L2 |



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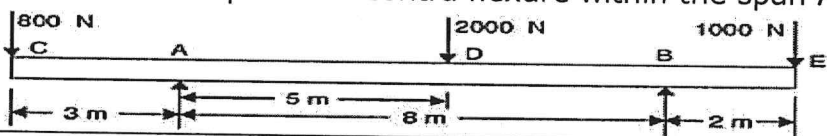
B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AE05-SOLID MECHANICS**

(ASE)

Time : 3 hours

Max. Marks : 70

| Q.No | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                                               | Marks | CO  | BL |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a) | Define the term poissons ratio.                                                                                                                                                                                                                                                                                                                                                                                                   | 2 M   | CO1 | L1 |
| (b)  | Define volumetric strain.                                                                                                                                                                                                                                                                                                                                                                                                         | 2 M   | CO1 | L1 |
| (c)  | Define Simply supported and Overhanging beam with sketches.                                                                                                                                                                                                                                                                                                                                                                       | 2 M   | CO2 | L1 |
| (d)  | Define the term shear force.                                                                                                                                                                                                                                                                                                                                                                                                      | 2 M   | CO2 | L1 |
| (e)  | Define the term moment of resistance.                                                                                                                                                                                                                                                                                                                                                                                             | 2 M   | CO3 | L1 |
| (f)  | Define the term polar moment of inertia.                                                                                                                                                                                                                                                                                                                                                                                          | 2 M   | CO3 | L1 |
| (g)  | Sketch the shear stress distribution for T and triangular section.                                                                                                                                                                                                                                                                                                                                                                | 2 M   | CO4 | L1 |
| (h)  | Define the term principal plane.                                                                                                                                                                                                                                                                                                                                                                                                  | 2 M   | CO4 | L1 |
| (i)  | Compare circumferential with longitudinal stress in case of a thin cylinder.                                                                                                                                                                                                                                                                                                                                                      | 2 M   | CO5 | L2 |
| (j)  | Write a short notes on macaulay's methods.                                                                                                                                                                                                                                                                                                                                                                                        | 2 M   | CO5 | L1 |
| Q.No | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                                                                   | Marks | CO  | BL |
| 2(a) | Derive the expression for strain energy stored in a bar subjected to impact load.                                                                                                                                                                                                                                                                                                                                                 | 4 M   | CO1 | L3 |
| (b)  | Two vertical rods one of steel and the other of copper are each rigidly fixed at the and 50cm apart. Diameters and lengths of each rods are 2cm and 4cm respectively. A cross bar fixed to the rods at the lower ends carries a load of 5000N such that the cross bar remain horizontal even after loading. Find the stress in each rod and the position of the load on the bar. Take E for steel 200Gpa and E for copper 100Gpa. | 6 M   | CO1 | L3 |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |     |    |
| 3(a) | Derive an expression for volumetric strain of a rectangular body subjected to direct stress in one direction.                                                                                                                                                                                                                                                                                                                     | 5 M   | CO1 | L3 |
| (b)  | Derive the relation between modulus of elasticity and bulk modulus.                                                                                                                                                                                                                                                                                                                                                               | 5 M   | CO1 | L3 |
| 4.   | Evaluate Shear force and Bending moment and Draw shear force and bending moment diagrams for which is loaded as shown in figure. Determine the points of contra flexure within the span AB.<br>                                                                                                                                               | 10 M  | CO2 | L3 |
| (OR) |                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |     |    |
| 5(a) | A cantilever of length 3 m carries a uniformly distributed load of 1.5 kN/m run over a length of 2.25 m from the fixed end, and a point load of 1.5 kN at the free end. Sketch the SFD and BMD.                                                                                                                                                                                                                                   | 5 M   | CO2 | L3 |
| (b)  | A simply supported beam of length 3 m carries a uniformly distributed load of 12 kN/m over the entire length. Sketch the SFD and BMD.                                                                                                                                                                                                                                                                                             | 5 M   | CO2 | L3 |



|             |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|----|
| 6(a)        | A simply supported timber beam has a span of 4m. It carries a uniformly distributed load of 10kN/m. If the stress in the timber is not to exceed 14N/mm <sup>2</sup> . Determine the depth and width of section. The depth is 1.5 of the width.                                                                                                                                            | 5 M  | CO3 | L3 |
| (b)         | Find the maximum shear stress if the diameter of the solid shaft is 25cm and torsional moment 2300 N-m.                                                                                                                                                                                                                                                                                    | 5 M  | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
| 7(a)        | A triangular beam of width 300 mm and depth 400 mm is simply supported over a span of 4 m. Find the safe uniformly distributed load that the beam can carry per metre length if the allowable bending stress in the beam is 150 N/mm <sup>2</sup> .                                                                                                                                        | 5 M  | CO3 | L3 |
| (b)         | Derive an expression for section modulus(Z) for solid circular shaft.                                                                                                                                                                                                                                                                                                                      | 5 M  | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
| 8(a)        | Show the shear stress distribution across a circular section.                                                                                                                                                                                                                                                                                                                              | 4 M  | CO4 | L2 |
| (b)         | A beam of I section 50 cm x 2 cm for both flange and 40cm x 2cm web dimension. It carries at a cross-section a shear force of 120kN. Determine the shear stress distribution in the beam and the ratio of maximum shear to mean shear.                                                                                                                                                     | 6 M  | CO4 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
| 9.          | At a point within a body subjected to two mutually perpendicular directions the stresses are 80N/mm <sup>2</sup> tensile and 50N/mm <sup>2</sup> compressive. Each of the above stresses is accompanied by a shear stress of 60N/mm <sup>2</sup> . Determine the normal, shear and resultant stress on an oblique plane inclined at an angle of 30° with the axis of minor tensile stress. | 10 M | CO4 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
| 10(a)       | By using Double integration method find the slope and deflection at free end of a cantilever beam of span 'L' subjected to point load of W kN at its free end.                                                                                                                                                                                                                             | 5 M  | CO5 | L3 |
| (b)         | A thick cylinder of 150mm outside diameter and 100mm inside diameter is subjected to internal pressure of 70Mpa. Determine the maximum and minimum intensities of circumferential stress in the material of the cylinder at the inside diameter. Sketch the stress distribution diagram.                                                                                                   | 5 M  | CO5 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                                            |      |     |    |
| 11(a)       | A beam of uniform section 5m long is simply supported at the ends. It carries point load of 50kN at a distances of 3m respectively from the left end. Calculate the deflection under 50 kN load. Take $E = 210 \times 10^6 \text{ kN/m}^2$ , $I = 128 \times 10^{-4} \text{ m}^4$ .                                                                                                        | 5 M  | CO5 | L3 |
| (b)         | A cylindrical vessel is 1.4m diameter and 4m long is closed at ends by rivets. It is subjected to an internal pressure of 3N/mm <sup>2</sup> . If the maximum principal stress is not to exceed 100N/mm <sup>2</sup> , find the thickness of the shell. Assume $E = 2.1 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.30.                                                            | 5 M  | CO5 | L3 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram - 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CE06-STRUCTURAL ANALYSIS**

(CE)

Time : 3 hours

Max. Marks : 70

| Q.No | Compulsory Question                                                                                                                                                               | Marks | CO  | BL |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a) | What is strain energy stored due to bending in a simple beam of span 'L' subjected to central point load 'P'.                                                                     | 2M    | CO1 | L1 |
| (b)  | State Castigliano's first theorem and mention its applications.                                                                                                                   | 2M    | CO1 | L1 |
| (c)  | What is the kinematic indeterminacy of fixed beam?                                                                                                                                | 2M    | CO2 | L1 |
| (d)  | Write an expression for finding the unknown force 'x' in a truss using Castigliano's theorem.                                                                                     | 2M    | CO2 | L1 |
| (e)  | Indicate the fixed end moments of fixed beam of span 'L' subjected to varying load of intensity 'w' at left end and zero at right end.                                            | 2M    | CO3 | L1 |
| (f)  | What is the ratio of maximum deflection of fixed and simply supported beam of span 'L' subjected to a point load 'W' at the centre?                                               | 2M    | CO3 | L1 |
| (g)  | A continuous beam consists of two spans each of length 'L' is fixed at left end and simply supported at other ends, what is the slope deflection equation available in this case? | 2M    | CO4 | L1 |
| (h)  | What are the conditions for the frame, not subjected to any sway moments?                                                                                                         | 2M    | CO4 | L1 |
| (i)  | Define carry over factor and distribution factor.                                                                                                                                 | 2M    | CO5 | L1 |
| (j)  | What are the advantages of moment distribution method?                                                                                                                            | 2M    | CO5 | L1 |

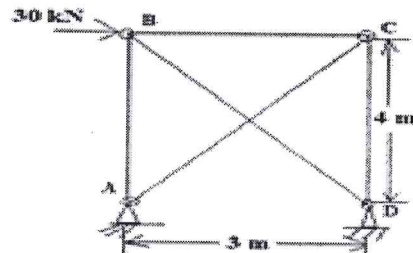
| Q.No | All questions carry equal marks                                                                                                                                                      | Marks | CO  | BL |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 2(a) | Derive an expression for strain energy for a beam AB of length 'L' due to bending moment.                                                                                            | 5M    | CO1 | L2 |
| (b)  | Using Castigliano's first theorem, find the deflection at the free end of the cantilever beam shown in figure. Given $E = 200 \text{ kN/mm}^2$ , $I = 10 \times 10^6 \text{ mm}^4$ . | 5M    | CO1 | L3 |



(OR)

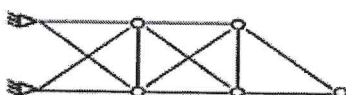
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|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 3(a) | Derive an expression for strain energy for a beam AB of length 'L' due to axial force.                                                                                                                         | 5M | CO1 | L2 |
| (b)  | A simply supported beam of span 5 m carries a UDL of intensity 4 kN/m over the entire span. Using Castigliano's theorem-1 find the maximum slope in the beam in terms of EI. Assume uniform flexural rigidity. | 5M | CO1 | L3 |

|    |                                                                                                                                             |     |     |    |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 4. | Calculate the forces in the truss shown and find the horizontal deflection at C. Take EA to be $10 \times 10^4 \text{ kN}$ for all members. | 10M | CO2 | L3 |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|

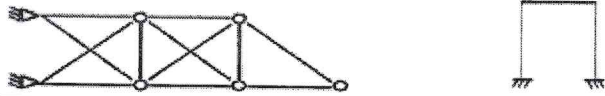
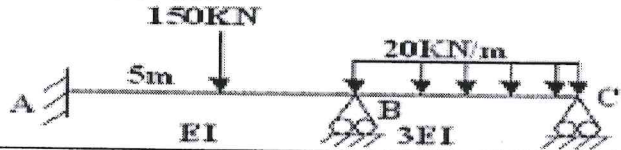
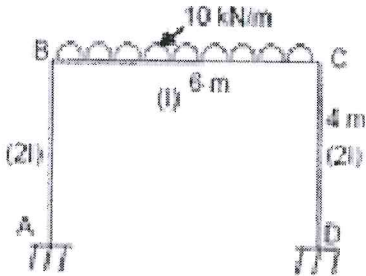
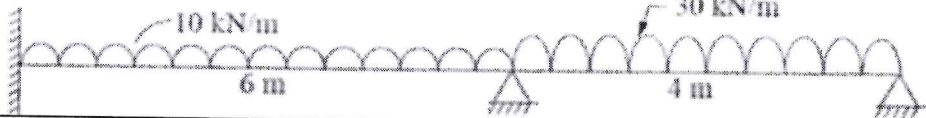
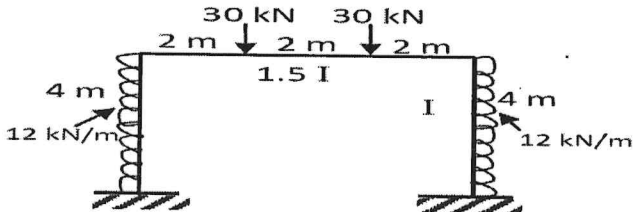


(OR)

|      |                                                               |    |     |    |
|------|---------------------------------------------------------------|----|-----|----|
| 5(a) | Determine the static indeterminacy of the frames shown below. | 5M | CO2 | L3 |
|------|---------------------------------------------------------------|----|-----|----|





|                                                                                      |                                                                                                                                                                                                                |     |     |    |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| (b)                                                                                  | Determine the kinematic indeterminacy of the frames shown below.                                                                                                                                               | 5M  | CO2 | L2 |
|    |                                                                                                                                                                                                                |     |     |    |
| 6(a)                                                                                 | A fixed beam of length 6 m carries two point loads of 30 kN each at a distance of 2 m from both ends. Determine the fixed end moments and draw BMD.                                                            | 5M  | CO3 | L3 |
| (b)                                                                                  | Determine the end moments and support reactions of a fixed beam of span 'L' and the right support settles upwards by 'D' mm.                                                                                   | 5M  | CO3 | L3 |
| (OR)                                                                                 |                                                                                                                                                                                                                |     |     |    |
| 7(a)                                                                                 | Determine the moments and reactions at the supports of the fixed-fixed beam which is loaded by a concentrated load of 20 kN at a point 5 m from the left support. The span of the beam is 12 m. EI is constant | 5M  | CO3 | L3 |
| (b)                                                                                  | Determine the end moments and support reactions of a fixed beam of span 'L' and the left support rotates by 'θ' degrees in counterclockwise direction.                                                         | 5M  | CO3 | L3 |
| 8(a)                                                                                 | Analyse continuous beam shown in figure using slope deflection method. Given AB=BC=10m                                                                                                                         | 5M  | CO4 | L3 |
|   |                                                                                                                                                                                                                |     |     |    |
| (b)                                                                                  | Draw Bending moment diagram for the above problem.                                                                                                                                                             | 5M  | CO4 | L3 |
| (OR)                                                                                 |                                                                                                                                                                                                                |     |     |    |
| 9.                                                                                   | Analyze the portal frame shown in figure using slope deflection method.                                                                                                                                        | 10M | CO4 | L3 |
|   |                                                                                                                                                                                                                |     |     |    |
| 10(a)                                                                                | Analyse the continuous beam shown in Fig. by the moment distribution method. The beam is of uniform section                                                                                                    | 7M  | CO5 | L3 |
|  |                                                                                                                                                                                                                |     |     |    |
| (b)                                                                                  | Sketch the Bending moment diagram.                                                                                                                                                                             | 3M  | CO5 | L3 |
| (OR)                                                                                 |                                                                                                                                                                                                                |     |     |    |
| 11.                                                                                  | Analyze the portal frame shown in figure using moment distribution method.                                                                                                                                     | 10M | CO5 | L3 |
|   |                                                                                                                                                                                                                |     |     |    |

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L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CS03-DATABASE MANAGEMENT SYSTEMS**

(CSE,CSE(AI&ML) and IT)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                 | Marks | CO  | BL |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | What do you mean by physical data independence?                                                                                                                                     | 2M    | CO1 | L1 |
| (b)   | Give examples on Naive users in database system.                                                                                                                                    | 2M    | CO1 | L1 |
| (c)   | Define cardinality ratio in DBMS.                                                                                                                                                   | 2M    | CO2 | L2 |
| (d)   | Which SQL construct enables the definition of a relation?                                                                                                                           | 2M    | CO2 | L2 |
| (e)   | Give syntax for ALTER statement in SQL.                                                                                                                                             | 2M    | CO3 | L3 |
| (f)   | Mention the purpose of HAVING clause in SQL.                                                                                                                                        | 2M    | CO3 | L2 |
| (g)   | Why we do Normalization?                                                                                                                                                            | 2M    | CO4 | L2 |
| (h)   | Define primary rule in BCNF.                                                                                                                                                        | 2M    | CO4 | L1 |
| (i)   | What is Conflict Serializability?                                                                                                                                                   | 2M    | CO5 | L1 |
| (j)   | Define recoverable schedule.                                                                                                                                                        | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                     | Marks | CO  | BL |
| 2(a)  | Describe Client-Server architecture for database system.                                                                                                                            | 5M    | CO1 | L2 |
| (b)   | Draw and explain three levels of data abstraction.                                                                                                                                  | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                                                     |       |     |    |
| 3(a)  | Differentiate Object-based and Semi-structured Data Models.                                                                                                                         | 5M    | CO1 | L2 |
| (b)   | List five applications which most likely used a database system to persistent data.                                                                                                 | 5M    | CO1 | L2 |
| 4.    | Describe various rules to translate an ER diagram into tables. How are entity sets and relationship sets mapped into relations? In what way constraints can be handled in ER model? | 10M   | CO2 | L2 |
| (OR)  |                                                                                                                                                                                     |       |     |    |
| 5(a)  | Explain different types of Join operations in relational algebra.                                                                                                                   | 5M    | CO2 | L2 |
| (b)   | Name the main steps in database design. What is the goal of each step? In which step is the ER model mainly used?                                                                   | 5M    | CO2 | L2 |
| 6(a)  | What type of operators supported by SQL expressions?                                                                                                                                | 5M    | CO3 | L3 |
| (b)   | Discuss any five Date and Time functions in SQL with example.                                                                                                                       | 5M    | CO3 | L3 |
| (OR)  |                                                                                                                                                                                     |       |     |    |
| 7.    | Demonstrate ANY, ALL, EXISTS and IN operators in SQL nested queries                                                                                                                 | 10M   | CO3 | L3 |
| 8(a)  | Illustrate the problems caused by data redundancy.                                                                                                                                  | 5M    | CO4 | L3 |
| (b)   | Describe Multivalued Dependency and explain how it is correlated to 4NF with suitable example.                                                                                      | 5M    | CO4 | L3 |
| (OR)  |                                                                                                                                                                                     |       |     |    |
| 9(a)  | Compute the Closure of set of functional dependencies for relation schema R(A,B,C,G,H,I) and the set of functional dependencies: A→B, A→C, CG→H, CG→I, B→H                          | 5M    | CO4 | L3 |
| (b)   | Demonstrate Fifth Normal Form (5NF).                                                                                                                                                | 5M    | CO4 | L3 |
| 10(a) | Define the terms transaction, schedule, complete schedule and serial schedule.                                                                                                      | 5M    | CO4 | L2 |
| (b)   | What benefit does strict two-phase locking provide? What disadvantages it results?                                                                                                  | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                                                     |       |     |    |
| 11(a) | What are the ACID properties of transaction? Illustrate them through examples.                                                                                                      | 5M    | CO5 | L2 |
| (b)   | Describe the role of Check points in database recovery mechanism.                                                                                                                   | 5M    | CO5 | L2 |



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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EC06-ELECTRONIC CIRCUIT ANALYSIS**

(ECE)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                                                                   | Marks | CO  | BL |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | What factors affect the high-frequency response of an amplifier?                                                                                                                                                                                      | 2M    | CO1 | L1 |
| (b)   | Define the Hybrid- $\pi$ model for a common emitter transistor.                                                                                                                                                                                       | 2M    | CO1 | L1 |
| (c)   | An $n$ number of stages are connected in cascade. Derive the expressions for the overall lower cutoff frequency.                                                                                                                                      | 2M    | CO4 | L2 |
| (d)   | What is the use of a transformer in a multistage amplifier?                                                                                                                                                                                           | 2M    | CO4 | L1 |
| (e)   | How does negative feedback improve amplifier stability?                                                                                                                                                                                               | 2M    | CO2 | L1 |
| (f)   | What is the impact of feedback on gain and bandwidth?                                                                                                                                                                                                 | 2M    | CO2 | L1 |
| (g)   | Why LC oscillators are not used at low frequencies.                                                                                                                                                                                                   | 2M    | CO3 | L1 |
| (h)   | State Barkhausen Criterion?                                                                                                                                                                                                                           | 2M    | CO3 | L1 |
| (i)   | List the characteristics of Class A power amplifiers.                                                                                                                                                                                                 | 2M    | CO2 | L1 |
| (j)   | Define Q-Factor in tuned amplifiers.                                                                                                                                                                                                                  | 2M    | CO2 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                                                       | Marks | CO  | BL |
| 2(a)  | Derive the expression for Hybrid - $\pi$ capacitance of CE transistor at high frequency.                                                                                                                                                              | 5M    | CO1 | L3 |
| (b)   | Derive the expression for cut off frequencies $f_{\alpha}$ , $f_{\beta}$ and $f_T$ .                                                                                                                                                                  | 5M    | CO1 | L3 |
| (OR)  |                                                                                                                                                                                                                                                       |       |     |    |
| 3(a)  | With the help of necessary circuit diagrams and approximations obtain the expression for CE Short circuit current gain.                                                                                                                               | 5M    | CO1 | L3 |
| (b)   | Derive the voltage gain equation for common source amplifier at high frequencies.                                                                                                                                                                     | 5M    | CO1 | L3 |
| 4(a)  | Explain the classification of amplifiers.                                                                                                                                                                                                             | 5M    | CO4 | L2 |
| (b)   | Derive expressions for $R_i$ , $R_o$ using $h$ -parameter model of a CC- CE amplifier.                                                                                                                                                                | 5M    | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                                       |       |     |    |
| 5(a)  | Discuss the need for cascading amplifiers.                                                                                                                                                                                                            | 5M    | CO4 | L2 |
| (b)   | Derive the expression for input resistance of a Darlington pair circuit.                                                                                                                                                                              | 5M    | CO4 | L3 |
| 6(a)  | Explain the concept of feedback with block diagram.                                                                                                                                                                                                   | 5M    | CO2 | L2 |
| (b)   | An amplifier has an input resistance of 200 K ohms, with certain negative feedback introduced in the above amplifier the input resistance is found to be 20 M ohms and overall gain is found to be 1000. Calculate the loop gain and feedback factor. | 5M    | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                       |       |     |    |
| 7(a)  | Explain the classification of amplifiers based on feedback topology.                                                                                                                                                                                  | 5M    | CO2 | L2 |
| (b)   | Calculate the closed loop gain ( $A_{CL}$ ) for a voltage series negative feedback amplifier if its open loop gain ( $A_v$ ) and feedback factor ( $\beta$ ) are $10^3$ and 0.01 respectively. Calculate $A_{CL}$ if $A_v$ increases by 40%.          | 5M    | CO2 | L3 |
| 8(a)  | Derive the expression frequency of oscillation of a Colpitts oscillator.                                                                                                                                                                              | 5M    | CO3 | L3 |
| (b)   | Derive the basic conditions for oscillations.                                                                                                                                                                                                         | 5M    | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                       |       |     |    |
| 9(a)  | Derive the expression frequency of oscillation of a BJT based RC Phase shift oscillator.                                                                                                                                                              | 5M    | CO3 | L3 |
| (b)   | Derive an expression for frequency of oscillation of Wien Bridge oscillator.                                                                                                                                                                          | 5M    | CO3 | L3 |
| 10.   | Explain the operation of class B push-Pull power amplifier.                                                                                                                                                                                           | 10M   | CO2 | L2 |
| (OR)  |                                                                                                                                                                                                                                                       |       |     |    |
| 11(a) | Derive an expression for bandwidth of a capacitive coupled tuned amplifier.                                                                                                                                                                           | 5M    | CO2 | L3 |
| (b)   | Discuss classification of tuned amplifiers.                                                                                                                                                                                                           | 5M    | CO2 | L2 |



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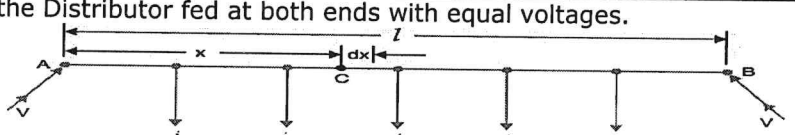
B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EE07-POWER SYSTEMS-I**

(EEE)

Time : 3 hours

Max. Marks : 70

| Q.No                                                                                 | Compulsory Question                                                                                                                                                                                                                                                                                                                   | Marks | CO  | BL |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)                                                                                 | State the working of Air pre-heater in thermal power plant.                                                                                                                                                                                                                                                                           | 2M    | CO1 | L1 |
| (b)                                                                                  | State any two types of turbines used in hydro power plant.                                                                                                                                                                                                                                                                            | 2M    | CO1 | L1 |
| (c)                                                                                  | Classify nuclear reactors.                                                                                                                                                                                                                                                                                                            | 2M    | CO2 | L1 |
| (d)                                                                                  | List any two types of wind turbines.                                                                                                                                                                                                                                                                                                  | 2M    | CO2 | L1 |
| (e)                                                                                  | List any two demerits of indoor substation.                                                                                                                                                                                                                                                                                           | 2M    | CO3 | L1 |
| (f)                                                                                  | List any two merits of air insulated substation.                                                                                                                                                                                                                                                                                      | 2M    | CO3 | L1 |
| (g)                                                                                  | Classify types of cables.                                                                                                                                                                                                                                                                                                             | 2M    | CO4 | L1 |
| (h)                                                                                  | List any two major requirements of a good distribution system.                                                                                                                                                                                                                                                                        | 2M    | CO4 | L1 |
| (i)                                                                                  | Define demand factor and diversity factor.                                                                                                                                                                                                                                                                                            | 2M    | CO5 | L1 |
| (j)                                                                                  | Define tariff.                                                                                                                                                                                                                                                                                                                        | 2M    | CO5 | L1 |
| Q.No                                                                                 | All questions carry equal marks                                                                                                                                                                                                                                                                                                       | Marks | CO  | BL |
| 2(a)                                                                                 | Explain the essential factors which influence the choice of site for hydroelectric plant.                                                                                                                                                                                                                                             | 5M    | CO1 | L2 |
| (b)                                                                                  | Classify the hydropower plants based on the head and explain the operation of any of the hydro turbine with neat sketch.                                                                                                                                                                                                              | 5M    | CO1 | L2 |
| (OR)                                                                                 |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 3(a)                                                                                 | Explain the schematic of a thermal power plant with a neat sketch.                                                                                                                                                                                                                                                                    | 5M    | CO1 | L2 |
| (b)                                                                                  | Explain the operation of impulse turbine with neat sketch.                                                                                                                                                                                                                                                                            | 5M    | CO1 | L2 |
| 4(a)                                                                                 | Explain the working principle of BWR reactor in nuclear power plant.                                                                                                                                                                                                                                                                  | 5M    | CO2 | L2 |
| (b)                                                                                  | Explain the importance of renewable energy for sustainability.                                                                                                                                                                                                                                                                        | 5M    | CO2 | L2 |
| (OR)                                                                                 |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 5(a)                                                                                 | Explain different types of PV Cells with neat sketch.                                                                                                                                                                                                                                                                                 | 5M    | CO2 | L2 |
| (b)                                                                                  | Explain the components of a wind power plant with neat diagram.                                                                                                                                                                                                                                                                       | 5M    | CO2 | L3 |
| 6(a)                                                                                 | Draw and explain double bus bar with one and two circuit breakers.                                                                                                                                                                                                                                                                    | 5M    | CO3 | L3 |
| (b)                                                                                  | Explain the difference between indoor and outdoor substation.                                                                                                                                                                                                                                                                         | 5M    | CO3 | L3 |
| (OR)                                                                                 |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 7(a)                                                                                 | Explain the main and transfer bus bar system with necessary diagrams.                                                                                                                                                                                                                                                                 | 5M    | CO3 | L3 |
| (b)                                                                                  | Explain the constructional aspects of gas insulated substations with neat sketch.                                                                                                                                                                                                                                                     | 5M    | CO3 | L3 |
| 8(a)                                                                                 | Explain with neat sketch the construction of underground cable.                                                                                                                                                                                                                                                                       | 5M    | CO4 | L3 |
| (b)                                                                                  | Define and explain the terms : feeder, distributor and service mains.                                                                                                                                                                                                                                                                 | 5M    | CO4 | L2 |
| (OR)                                                                                 |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 9(a)                                                                                 | Deduce an expression for the capacitance of a single-core cable.                                                                                                                                                                                                                                                                      | 5M    | CO4 | L3 |
| (b)                                                                                  | Explain the Distributor fed at both ends with equal voltages.                                                                                                                                                                                                                                                                         | 5M    | CO4 | L3 |
|  |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 10(a)                                                                                | A generating station has a maximum demand of 25MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 72%. Find (i) the reserve capacity of the plant (ii) the daily energy produced and (iii) maximum energy that could be produced daily if the plant while running as per schedule, were fully loaded. | 5M    | CO5 | L3 |
| (b)                                                                                  | A generating station has an installed capacity of 50,000 kW and delivers $220 \times 10^6$ units per annum. If the annual fixed charges are Rs 160 per kW installed capacity and running charges are 4 paise per kWh, determine the cost per unit generated.                                                                          | 5M    | CO5 | L3 |
| (OR)                                                                                 |                                                                                                                                                                                                                                                                                                                                       |       |     |    |
| 11(a)                                                                                | Explain the different types of tariffs.                                                                                                                                                                                                                                                                                               | 5M    | CO5 | L4 |
| (b)                                                                                  | A consumer has a maximum demand of 300kW at 35% load factor. If the tariff is Rs 125 per kW of maximum demand plus 15 paise per kWh, calculate the overall cost per kWh.                                                                                                                                                              | 5M    | CO5 | L3 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23ME07-FLUID MECHANICS & HYDRAULIC MACHINES**

(ME)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                                                                                                                                                                          | Marks | CO  | BL |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Define the term "Specific gravity".                                                                                                                                                                                                                                                                                                                          | 2M    | CO1 | L1 |
| (b)   | What is meant by meta Centre in Buoyancy?                                                                                                                                                                                                                                                                                                                    | 2M    | CO1 | L1 |
| (c)   | Define Path line.                                                                                                                                                                                                                                                                                                                                            | 2M    | CO2 | L1 |
| (d)   | State the momentum equation.                                                                                                                                                                                                                                                                                                                                 | 2M    | CO2 | L1 |
| (e)   | What is the expression for Reynold's number for boundary layer?                                                                                                                                                                                                                                                                                              | 2M    | CO3 | L1 |
| (f)   | How many variables can be solved using Rayleigh's method?                                                                                                                                                                                                                                                                                                    | 2M    | CO3 | L1 |
| (g)   | Define the term "jet".                                                                                                                                                                                                                                                                                                                                       | 2M    | CO4 | L1 |
| (h)   | What is the function of spear rod?                                                                                                                                                                                                                                                                                                                           | 2M    | CO4 | L1 |
| (i)   | List any two methods to control cavitation in hydraulic turbines.                                                                                                                                                                                                                                                                                            | 2M    | CO5 | L1 |
| (j)   | Mention any two applications of reciprocating pumps.                                                                                                                                                                                                                                                                                                         | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                                                                                                                                                              | Marks | CO  | BL |
| 2(a)  | Formulate an expression for the surface tension on a hollow bubble.                                                                                                                                                                                                                                                                                          | 5M    | CO1 | L3 |
| (b)   | If the velocity distribution over a plate is given by $u = (2/3) y - y^2$ in which $u$ is the velocity in meter per second at a distance $y$ meter above the plate, estimate the shear stress at $y=0$ and $y=0.15$ m. Take dynamic viscosity of fluids as 8.63 poises.                                                                                      | 5M    | CO1 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                              |       |     |    |
| 3(a)  | Deduce an expression for the meta Centre height.                                                                                                                                                                                                                                                                                                             | 5M    | CO1 | L3 |
| (b)   | Find the volume of the water displaced and position of the buoyancy for a wooden block of width 2.5m and depth 1.5 when it flows horizontally in water. The density of wooden block is 650kg/m <sup>3</sup> and length is 6 m.                                                                                                                               | 5M    | CO1 | L3 |
| 4.    | Formulate an expression for the Bernoulli's equation.                                                                                                                                                                                                                                                                                                        | 10M   | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                              |       |     |    |
| 5(a)  | Illustrate the Reynold's experiment.                                                                                                                                                                                                                                                                                                                         | 5M    | CO2 | L2 |
| (b)   | The diameter of a pipe at the sections 1 and 2 are 10cm and 15cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5m/s. Also evaluate the velocity at section 2.                                                                                                                          | 5M    | CO2 | L3 |
| 6.    | Formulate an expression for the displacement thickness.                                                                                                                                                                                                                                                                                                      | 10M   | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                              |       |     |    |
| 7(a)  | Elaborate the steps involved in Rayleigh's method.                                                                                                                                                                                                                                                                                                           | 5M    | CO3 | L2 |
| (b)   | The time period 'T' of a pendulum depends upon the length (L) of the pendulum and acceleration due to gravity (g). Estimate an expression for the time period.                                                                                                                                                                                               | 5M    | CO3 | L3 |
| 8(a)  | Deduce an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.                                                                                                                                                                                                                                          | 5M    | CO4 | L3 |
| (b)   | Evaluate the force exerted by a jet of water 75mm on a stationary flat plate, when the jet strikes the plate normally with velocity of 20m/s.                                                                                                                                                                                                                | 5M    | CO4 | L3 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                              |       |     |    |
| 9(a)  | Illustrate the Kaplan turbine.                                                                                                                                                                                                                                                                                                                               | 5M    | CO4 | L2 |
| (b)   | A Pelton wheel is to be designed for the following specifications: shaft power= 11,772 KW; head= 380 meters; speed = 750 r.p.m; overall efficiency= 86%; jet diameter is not to exceed one-sixth of the wheel diameter. Estimate: (i) the wheel diameter (ii) the number of jets required (iii) diameter of jet. Take $K_{v1} = 0.985$ and $K_{u1} = 0.45$ . | 5M    | CO4 | L3 |
| 10(a) | Formulate an expression for the specific speed of hydraulic turbine.                                                                                                                                                                                                                                                                                         | 5M    | CO5 | L3 |
| (b)   | Illustrate the performance characteristics curves of hydraulic turbines.                                                                                                                                                                                                                                                                                     | 5M    | CO5 | L2 |
| (OR)  |                                                                                                                                                                                                                                                                                                                                                              |       |     |    |
| 11(a) | Describe the working principle of Centrifugal pump with neat sketch.                                                                                                                                                                                                                                                                                         | 5M    | CO5 | L2 |
| (b)   | Formulate an expression for the work done by reciprocating pump.                                                                                                                                                                                                                                                                                             | 5M    | CO5 | L3 |

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L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23IT01-DIGITAL LOGIC & COMPUTER ORGANIZATION**

(AI&amp;DS and CSE(AI&amp;ML))

Time : 3 hours

Max. Marks : 70

| Q.No        | Compulsory Question                                                                                                       | Marks | CO  | BL |
|-------------|---------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | What is Gray Code? Convert 1001001 Binary code to Gray code.                                                              | 2M    | CO1 | L2 |
| (b)         | Explain which gate is called Inverter gate.                                                                               | 2M    | CO1 | L2 |
| (c)         | What is Flip Flop?                                                                                                        | 2M    | CO2 | L1 |
| (d)         | Define MAR and Purpose of it.                                                                                             | 2M    | CO2 | L2 |
| (e)         | What is Two's Complement, and why is it preferred?                                                                        | 2M    | CO3 | L2 |
| (f)         | What is multi programmed control?                                                                                         | 2M    | CO3 | L1 |
| (g)         | What is Volatile and No-Volatile Memory?                                                                                  | 2M    | CO4 | L1 |
| (h)         | Explain the purpose of a memory address in a computer system.                                                             | 2M    | CO4 | L2 |
| (i)         | What is PCI bus?                                                                                                          | 2M    | CO5 | L1 |
| (j)         | Acronym of USB and SATA.                                                                                                  | 2M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| Q.No        | All questions carry equal marks                                                                                           | Marks | CO  | BL |
| 2(a)        | Convert 6520 <sub>(10)</sub> into i. BCD , ii. Exces-3, iii. Binary .                                                     | 5M    | CO1 | L3 |
| (b)         | In number system, If $(211)_X = (152)_8$ then find Base X .                                                               | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 3(a)        | Minimize the following Boolean function- using K-Map<br>$F(A, B, C) = \sum m(0, 1, 4, 5, 6) + \sum d(2, 3, 7)$ .          | 5M    | CO1 | L3 |
| (b)         | Find the reduced POS form of the function<br>$F = ABC'D' + ABC'D + AB'C'D + ABCD + AB'CD + ABCD' + AB'CD'$ .              | 5M    | CO1 | L3 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 4.          | Explain the concept of a synchronous counter. Describe the design of a 4-bit synchronous binary counter with truth table. | 10M   | CO2 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 5(a)        | What are sequential circuits and how do they differ from combinational circuits?                                          | 5M    | CO2 | L2 |
| (b)         | List and briefly define the main structural components of a computer.                                                     | 5M    | CO2 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 6(a)        | Explain the methods used for addition of signed numbers in computer.                                                      | 5M    | CO3 | L2 |
| (b)         | Define Fast Adders design a carry look ahead adder.                                                                       | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 7(a)        | Explain all the phases of instruction cycle.                                                                              | 5M    | CO3 | L2 |
| (b)         | Define multi programmed control and explain how it enhances system performance.                                           | 5M    | CO3 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 8(a)        | Briefly explain the basic concepts of memory organization.                                                                | 5 M   | CO4 | L2 |
| (b)         | Describe the characteristics and types of ROM memories.                                                                   | 5 M   | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 9.          | Explain virtual memory and its importance in modern computers.                                                            | 10M   | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 10(a)       | Explain the role and structure of interface circuits in I/O systems.                                                      | 5M    | CO5 | L2 |
| (b)         | Describe in detail, why input-output interface is required?                                                               | 5M    | CO5 | L2 |
| <b>(OR)</b> |                                                                                                                           |       |     |    |
| 11(a)       | Write short note on interrupts.                                                                                           | 5M    | CO5 | L2 |
| (b)         | Briefly explain in detail the DMA controller.                                                                             | 5M    | CO5 | L2 |

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L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.  
B.Tech. (IV Semester) Regular/Supplementary Examinations

**23AE06-AERODYNAMICS**

(ASE)

Time : 3 hours

Max. Marks : 70

| Q.No  | Compulsory Question                                                                                                                                                                                              | Marks | CO  | BL |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)  | Write Laplace equation in cylindrical coordinates.                                                                                                                                                               | 2M    | CO1 | L1 |
| (b)   | Identify and explain simple vortex flow.                                                                                                                                                                         | 2M    | CO1 | L1 |
| (c)   | Describe transformation of circle to ellipse using conformal mapping.                                                                                                                                            | 2M    | CO2 | L2 |
| (d)   | Explain the physical meaning of conformal mapping.                                                                                                                                                               | 2M    | CO2 | L2 |
| (e)   | Define angle of attack and its significance in airfoil theory.                                                                                                                                                   | 2M    | CO3 | L1 |
| (f)   | Recall Kutta condition in thin airfoil theory.                                                                                                                                                                   | 2M    | CO3 | L1 |
| (g)   | Define vortex filament and its use in lifting line theory.                                                                                                                                                       | 2M    | CO4 | L1 |
| (h)   | Explain induced velocity due to trailing vortex.                                                                                                                                                                 | 2M    | CO4 | L1 |
| (i)   | Recall momentum thickness in boundary layers.                                                                                                                                                                    | 2M    | CO5 | L1 |
| (j)   | Explain the difference between laminar and turbulent boundary layers.                                                                                                                                            | 2M    | CO5 | L1 |
| Q.No  | All questions carry equal marks                                                                                                                                                                                  | Marks | CO  | BL |
| 2(a)  | Calculate the velocity field of a flow resulting from the superposition of a uniform stream and a source at the origin.                                                                                          | 5M    | CO1 | L3 |
| (b)   | Explain streamline and equipotential line concept in ideal flow.                                                                                                                                                 | 5M    | CO1 | L2 |
| (OR)  |                                                                                                                                                                                                                  |       |     |    |
| 3(a)  | A source of strength $5 \text{ m}^2/\text{s}$ is placed in a uniform flow of $10 \text{ m/s}$ . Determine the streamline pattern and stagnation point.                                                           | 5M    | CO1 | L3 |
| (b)   | Apply the Laplace equation in cylindrical coordinates to describe axisymmetric potential flow.                                                                                                                   | 5M    | CO1 | L3 |
| 4.    | Apply Kutta-Joukowski transformation to derive the shape of a cambered airfoil. Support with diagram.                                                                                                            | 10M   | CO2 | L3 |
| (OR)  |                                                                                                                                                                                                                  |       |     |    |
| 5(a)  | Transform the uniform flow parallel to x-axis of the physical plane, with the transformation function $\zeta = z^2$ .                                                                                            | 5M    | CO2 | L3 |
| (b)   | Transform the circle of radius 'a' to ellipse using the Kutta-Joukowski transformation function. Consider the parameter 'b' as a constant in Kutta-Joukowski transformation function.                            | 5M    | CO2 | L3 |
| 6(a)  | A thin symmetrical airfoil of chord $1.5 \text{ m}$ at $5^\circ$ angle of attack flies at $40 \text{ m/s}$ in air ( $\rho = 1.225 \text{ kg/m}^3$ ). Calculate the lift per unit span using thin airfoil theory. | 5M    | CO3 | L3 |
| (b)   | Apply Kelvin's circulation theorem to explain starting vortex formation.                                                                                                                                         | 5M    | CO3 | L3 |
| (OR)  |                                                                                                                                                                                                                  |       |     |    |
| 7(a)  | Explain the assumptions behind thin airfoil theory.                                                                                                                                                              | 5M    | CO3 | L2 |
| (b)   | Calculate the moment coefficient for a cambered airfoil at zero angle of attack.                                                                                                                                 | 5M    | CO3 | L3 |
| 8(a)  | A finite wing has an elliptical lift distribution. Span= $10 \text{ m}$ , Aspect Ratio= $6$ , Lift Coefficient = $0.8$ . Calculate induced drag coefficient.                                                     | 5M    | CO4 | L3 |
| (b)   | Illustrate the mechanism of formation of trailing vortices at wing tips of finite wings.                                                                                                                         | 5M    | CO4 | L2 |
| (OR)  |                                                                                                                                                                                                                  |       |     |    |
| 9.    | Derive the expression for induced drag using Prandtl's lifting line theory and explain assumptions.                                                                                                              | 10M   | CO4 | L3 |
| 10(a) | Differentiate between laminar and turbulent boundary layers with proper sketches and examples.                                                                                                                   | 5M    | CO5 | L2 |
| (b)   | Explain the significance of Reynolds number in boundary layer formation. At what Reynolds number does transition from laminar to turbulent flow occur typically over a flat plate.                               | 5M    | CO5 | L2 |
| (OR)  |                                                                                                                                                                                                                  |       |     |    |
| 11(a) | For a linear velocity profile $u/U = y/\delta$ , derive the momentum thickness expression. If $\delta = 5 \text{ mm}$ , $U = 2 \text{ m/s}$ calculate $\theta$ .                                                 | 5M    | CO5 | L3 |
| (b)   | A flat plate $1 \text{ m}$ long is placed in a $3 \text{ m/s}$ airflow. Determine the boundary layer thickness at the trailing edge. Assume laminar flow, $\nu = 1.5 \times 10^{-5} \text{ m}^2/\text{s}$ .      | 5M    | CO5 | L3 |

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L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23CE07-HYDRAULICS & HYDRAULIC MACHINERY**  
(CE)

Time : 3 hours

Max. Marks : 70

9.2/4

| Q.No | Compulsory Question                                                                                                                                                                                                                                                                                             | Marks | CO  | BL |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a) | Draw a neat sketch of the Reynolds apparatus.                                                                                                                                                                                                                                                                   | 2M    | CO1 | L1 |
| (b)  | Enumerate examples of laminal flow.                                                                                                                                                                                                                                                                             | 2M    | CO1 | L1 |
| (c)  | Define open channel.                                                                                                                                                                                                                                                                                            | 2M    | CO2 | L1 |
| (d)  | Find the velocity of flow through a rectangular channel of 4 m wide and 3 m deep. The bed slope of the is 1 in 2000. Take Chezy's constant $C = 60$ .                                                                                                                                                           | 2M    | CO3 | L1 |
| (e)  | Define sub critical flow and super critical flow.                                                                                                                                                                                                                                                               | 2M    | CO2 | L1 |
| (f)  | Find the critical depth when the discharge through the rectangular channel of width 3 m is $2\text{m}^3/\text{s}$ .                                                                                                                                                                                             | 2M    | CO3 | L1 |
| (g)  | Define the impulse-momentum equation.                                                                                                                                                                                                                                                                           | 2M    | CO4 | L1 |
| (h)  | Classify the turbines based on the direction of flow through runner and give an example.                                                                                                                                                                                                                        | 2M    | CO4 | L1 |
| (i)  | List out the main parts of centrifugal pump.                                                                                                                                                                                                                                                                    | 2M    | CO4 | L1 |
| (j)  | Define multistage pump.                                                                                                                                                                                                                                                                                         | 2M    | CO4 | L1 |
| Q.No | All questions carry equal marks                                                                                                                                                                                                                                                                                 | Marks | CO  | BL |
| 2(a) | Explain the capillary tube method to determining the co-efficient of viscosity of a liquid.                                                                                                                                                                                                                     | 5M    | CO1 | L2 |
| (b)  | Describe the boundary layer theory.                                                                                                                                                                                                                                                                             | 5M    | CO1 | L2 |
| (OR) |                                                                                                                                                                                                                                                                                                                 |       |     |    |
| 3(a) | Derive an expression for Hagen Poiseuille's formula.                                                                                                                                                                                                                                                            | 5M    | CO1 | L3 |
| (b)  | Determine (i) the pressure gradient (ii) the shear stress at the two horizontal parallel plates and (iii) the discharge per meter width for the laminar flow of oil with a maximum velocity of 2 m/s between two horizontal parallel fixed plates which are 100 mm apart. Given $\mu = 2.4525 \text{ Ns/m}^2$ . | 5M    | CO1 | L3 |
| 4(a) | Differentiate between open channel flow and pipe flow.                                                                                                                                                                                                                                                          | 5M    | CO2 | L2 |
| (b)  | A trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to carry water at $0.5 \text{ m}^3/\text{s}$ . take Chezy's constant as 80.                                                                    | 5M    | CO3 | L3 |
| (OR) |                                                                                                                                                                                                                                                                                                                 |       |     |    |
| 5(a) | Prove that for the rectangular channel of most section (i) Width of the Channel = Two times the depth of the channel (ii) Hydraulic mean depth = Half the depth of flow.                                                                                                                                        | 5M    | CO2 | L3 |
| (b)  | An open channel is V-shaped, and it is a most economical section. If it carries a discharge of $0.004 \text{ m}^3/\text{s}$ , when the depth of flow at the center is 225 mm, calculate the slope of the channel assuming that Chezy's Constant $C = 50$ .                                                      | 5M    | CO3 | L3 |
| 6(a) | Draw the specific energy curve and derive the condition for maximum discharge for a given value of specific energy.                                                                                                                                                                                             | 5M    | CO2 | L3 |



**23CE07-HYDRAULICS & HYDRAULIC MACHINERY**

|             |                                                                                                                                                                                                                                                                            |     |     |    |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| (b)         | A sluice gate discharges water into a horizontal rectangular channel with a velocity of 10 m/s and depth of flow of 1 m. Determine the depth of flow after the jump and consequent loss in total head.                                                                     | 5M  | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                            |     |     |    |
| 7(a)        | Derive an expression for the variation of depth along the length of the bed of the channel for gradually varied flow in an open channel.                                                                                                                                   | 5M  | CO2 | L3 |
| (b)         | The specific energy for a 5 m wide rectangular channel is to be 4Nm/N. if the rate of flow of water through the channel is 20 m <sup>3</sup> /s. determine the alternate depths of flow                                                                                    | 5M  | CO3 | L3 |
| 8(a)        | Derive an expression for the force exerted by a jet of water on a Stationary curved plate when jet strikes the curved plate at the centre.                                                                                                                                 | 5M  | CO4 | L3 |
| (b)         | Describe the causes and effects of Cavitation.                                                                                                                                                                                                                             | 5M  | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                            |     |     |    |
| 9.          | Design a Pelton wheel for a head of 60 m and running at 200r.p.m. The Pelton wheel develops 95.6475 kW shaft power. The velocity of the buckets = 0.45 times the velocity of the jet, overall efficiency = 0.85 and coefficient of the velocity is equal to 0.98.          | 10M | CO5 | L3 |
| 10(a)       | Differentiate between the volute casing and vertex casing for the centrifugal pump.                                                                                                                                                                                        | 5M  | CO4 | L2 |
| (b)         | A centrifugal pump is to discharge 0.118 m <sup>3</sup> /s at a speed of 1450r.p.m against a head of 25 m. the impeller diameter is 250mm. its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. | 5M  | CO5 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                            |     |     |    |
| 11(a)       | Derive an expression for the work done by the impeller of a centrifugal pump on liquid per second per unit weight of liquid.                                                                                                                                               | 5M  | CO4 | L3 |
| (b)         | The diameter of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m.                                                                               | 5M  | CO5 | L3 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23IT02-SOFTWARE ENGINEERING**

(CSE &amp; IT)

Time : 3 hours

Max. Marks :70

| Q.No        | Compulsory Question                                                                                              | Marks | CO  | BL |
|-------------|------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a)        | What is software engineering?                                                                                    | 2M    | CO1 | L1 |
| (b)         | Define Spiral model.                                                                                             | 2M    | CO1 | L1 |
| (c)         | What is SRS?                                                                                                     | 2M    | CO2 | L1 |
| (d)         | What is LOC?                                                                                                     | 2M    | CO2 | L1 |
| (e)         | Define Functional Requirements.                                                                                  | 2M    | CO3 | L1 |
| (f)         | Name two popular Agile process models.                                                                           | 2M    | CO3 | L1 |
| (g)         | What is black-box testing?                                                                                       | 2M    | CO4 | L1 |
| (h)         | What is integration testing?                                                                                     | 2M    | CO4 | L1 |
| (i)         | What is adaptive maintenance?                                                                                    | 2M    | CO5 | L1 |
| (j)         | What is Computer-Aided Software Engineering (CASE)?                                                              | 2M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| Q.No        | All questions carry equal marks                                                                                  | Marks | CO  | BL |
| 2(a)        | Explain Notable Changes in Software Engineering.                                                                 | 5M    | CO1 | L1 |
| (b)         | What is software engineering? And list some Advantages and disadvantages of software engineering.                | 5M    | CO1 | L2 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 3(a)        | Sketch the Agile Model and Explain it in detail.                                                                 | 5M    | CO1 | L3 |
| (b)         | Describe the Waterfall model and its phases.                                                                     | 5M    | CO1 | L2 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 4(a)        | Explain the COCOMO model in detail with its different versions.                                                  | 5M    | CO2 | L2 |
| (b)         | Explain the key responsibilities of a software project manager.                                                  | 5M    | CO2 | L2 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 5.          | Design an SRS document for a student management system with detailed functional and non-functional requirements. | 10M   | CO2 | L3 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 6(a)        | How does structured analysis improve the overall software development process?                                   | 5M    | CO3 | L2 |
| (b)         | What are the key principles of the Agile Process?                                                                | 5M    | CO3 | L1 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 7(a)        | Explain the main features of Extreme Programming (XP).                                                           | 5M    | CO3 | L2 |
| (b)         | What is a Data Flow Diagram (DFD)? How is it used in software design?                                            | 5M    | CO3 | L1 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 8(a)        | Explain the importance of code reviews in software development.                                                  | 5M    | CO4 | L2 |
| (b)         | What are some general issues faced during software testing?                                                      | 5M    | CO4 | L1 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 9(a)        | Explain Six Sigma methodology in detail.                                                                         | 5M    | CO4 | L2 |
| (b)         | What are some common debugging techniques used by developers?                                                    | 5M    | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 10(a)       | Explain the architecture of a CASE environment.                                                                  | 5M    | CO5 | L2 |
| (b)         | What are the challenges in implementing reuse at the organization level?                                         | 5M    | CO5 | L1 |
| <b>(OR)</b> |                                                                                                                  |       |     |    |
| 11(a)       | Compare Upper CASE, Lower CASE, and Integrated CASE tools.                                                       | 5M    | CO5 | L2 |
| (b)         | What are the benefits of reusing software components?                                                            | 5M    | CO2 | L1 |

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B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EC07-ANALOG COMMUNICATIONS**

(ECE)

Time : 3 hours

Max. Marks : 70

| Q.No | Compulsory Question                                                                                                                                                                                                                                            | Marks | CO  | BL |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 1(a) | Mention the types of amplitude modulation (AM) techniques.                                                                                                                                                                                                     | 2M    | CO1 | L1 |
| (b)  | What is the total power required for an AM signal represented as $s(t) = 10 \cos 4\pi 10^6 t (1 + 10 \cos 8000\pi t)$ ?                                                                                                                                        | 2M    | CO1 | L2 |
| (c)  | Which circuits are used for generating a double side band suppressed carrier amplitude modulated (DSBSC-AM) signal?                                                                                                                                            | 2M    | CO1 | L1 |
| (d)  | Compare the bandwidth of different amplitude modulation techniques.                                                                                                                                                                                            | 2M    | CO1 | L2 |
| (e)  | Write down the time domain representation of narrow band and wide band frequency modulated (FM) signals.                                                                                                                                                       | 2M    | CO2 | L1 |
| (f)  | Mention the approaches used for demodulation of FM signal.                                                                                                                                                                                                     | 2M    | CO2 | L1 |
| (g)  | Draw the block diagram of Reactance tube FM transmitter.                                                                                                                                                                                                       | 2M    | CO3 | L1 |
| (h)  | List out the limitations of Tuned radio frequency receiver.                                                                                                                                                                                                    | 2M    | CO3 | L1 |
| (i)  | Draw the block diagram of time division multiplexing (TDM).                                                                                                                                                                                                    | 2M    | CO4 | L1 |
| (j)  | Define pulse amplitude modulation (PAM).                                                                                                                                                                                                                       | 2M    | CO4 | L2 |
| Q.No | All questions carry equal marks                                                                                                                                                                                                                                | Marks | CO  | BL |
| 2(a) | Discuss about the need for modulation.                                                                                                                                                                                                                         | 5M    | CO1 | L2 |
| (b)  | An AM signal is represented as $s(t) = 10 \cos(4\pi \times 10^6 t)(1 + 2\cos(6000\pi t))$<br>Determine (i) Message and Carrier signal frequencies<br>(ii) Bandwidth (iii) Total power.                                                                         | 5M    | CO1 | L3 |
| (OR) |                                                                                                                                                                                                                                                                |       |     |    |
| 3(a) | Discuss about the manner in which a switching modulator can generate an amplitude modulated (AM) signal.                                                                                                                                                       | 5M    | CO1 | L2 |
| (b)  | Obtain the (i) Total power as well as power of sidebands<br>(ii) Frequency domain representation for the given amplitude modulated (AM) signal $s(t) = 5 \cos(2\pi \times 10^6 t)(1 + 2\cos(4000\pi t))$ .                                                     | 5M    | CO1 | L3 |
| 4(a) | Explain the filter method of generating single side band suppressed carrier amplitude modulated (SSB SC -AM) signal.                                                                                                                                           | 5M    | CO1 | L2 |
| (b)  | Find the percentage of power saving when the carrier and one of the side bands are suppressed in an AM signal modulated to a depth of 50 percent.                                                                                                              | 5M    | CO1 | L3 |
| (OR) |                                                                                                                                                                                                                                                                |       |     |    |
| 5(a) | Discuss about the demodulation of Vestigial sideband (VSB) signal using envelope detection.                                                                                                                                                                    | 5M    | CO1 | L2 |
| (b)  | Obtain the time domain representation of double side band suppressed carrier amplitude modulated (DSB SC -AM) signal for given message signal $m(t) = 5 \cos(4000\pi t)$ and $c(t) = 10 \cos(4\pi \times 10^6 t)$ . Also obtain the total power and bandwidth. | 5M    | CO1 | L3 |

**23EC07-ANALOG COMMUNICATIONS**

|             |                                                                                                                                                                                                                                                                    |    |     |    |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 6(a)        | Explain the demodulation of FM signal using zero crossing detector.                                                                                                                                                                                                | 5M | CO2 | L2 |
| (b)         | A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 75 kHz. Calculate the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is (i) 2 kHz (ii) 10 kHz. | 5M | CO2 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                    |    |     |    |
| 7(a)        | Discuss about the transmission bandwidth of FM signal.                                                                                                                                                                                                             | 5M | CO2 | L2 |
| (b)         | Obtain the expression for an FM signal with $m(t) = 5 \cos(4000\pi t)$ and $c(t) = 10 \cos(4\pi \times 10^6 t)$ . Determine the power of the FM signal when the frequency sensitivity is 10KHz/Volt.                                                               | 5M | CO2 | L3 |
|             |                                                                                                                                                                                                                                                                    |    |     |    |
| 8(a)        | Explain the functionality of AM low level transmitter with relevant block diagram.                                                                                                                                                                                 | 5M | CO3 | L2 |
| (b)         | Determine (i) The image frequency and its rejection ratio for a loaded Q of 50 (ii) The image frequency and its rejection ratio for a loaded Q of 25, for an FM receiver with input signal frequency 100MHz.                                                       | 5M | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                    |    |     |    |
| 9(a)        | Interpret the working of FM receiver by making use of relevant block diagram.                                                                                                                                                                                      | 5M | CO3 | L2 |
| (b)         | In a broadcast AM receiver, the loaded Q of the coupling circuit is 125. If the intermediate frequency is 455KHz, calculate image frequency and its rejection ratio at 1 MHz and 30 MHz.                                                                           | 5M | CO3 | L3 |
|             |                                                                                                                                                                                                                                                                    |    |     |    |
| 10(a)       | Discuss about the role of pre-emphasis and de-emphasis circuit in improving the noise performance of FM receiver.                                                                                                                                                  | 5M | CO4 | L2 |
| (b)         | Explain time division multiplexing.                                                                                                                                                                                                                                | 5M | CO4 | L2 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                    |    |     |    |
| 11(a)       | Derive the expression for input signal to noise ratio in SSB-SC AM receiver.                                                                                                                                                                                       | 5M | CO4 | L2 |
| (b)         | Discuss about the generation of pulse amplitude modulation.                                                                                                                                                                                                        | 5M | CO4 | L2 |

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**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram – 521 230 :: NTR Dist. :: A.P.

B.Tech. (IV Semester) Regular/Supplementary Examinations

**23EE08-INDUCTION AND SYNCHRONOUS MACHINES**  
(EEE)

222

Time : 3 hours

Max. Marks : 70

| Q.No                 | Compulsory Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Marks             | CO        | BL        |      |    |    |                      |      |      |      |      |      |     |     |    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-----------|------|----|----|----------------------|------|------|------|------|------|-----|-----|----|
| 1(a)                 | On which factors the torque produced in an induction motor depends. State the torque equation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2 M               | CO1       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | 6 pole, 50 Hz, 3-phase induction motor runs at 800 r.p.m. at full load. Determine the value of slip at this load condition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2 M               | CO1       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (c)                  | Obtain the expression of starting torque from the basic torque equation for an induction motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2 M               | CO1       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (d)                  | State the various losses occurring in an induction motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2 M               | CO1       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (e)                  | Why is single phase induction motor not self-starting?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2 M               | CO2       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (f)                  | Name the starting methods for single phase induction motors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2 M               | CO2       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (g)                  | What are the two types of synchronous generators? Where are they used suitably?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2 M               | CO3       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (h)                  | What are the conditions for parallel operation of Alternators?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2 M               | CO3       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (i)                  | What is Hunting in Synchronous Motor?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2 M               | CO4       | L1        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (j)                  | What is Synchronous Condenser? State its application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2 M               | CO4       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>Q.No</b>          | <b>All questions carry equal marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Marks</b>      | <b>CO</b> | <b>BL</b> |      |    |    |                      |      |      |      |      |      |     |     |    |
| 2(a)                 | Illustrate the principle of operation of 3-phase Induction Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5M                | CO1       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | A 3-phase, 6 pole, 50 Hz, induction motor has a slip of 1% at no-load and 3% at full load. Determine (i) Synchronous speed (ii) No-load speed (iii) Full load speed (iv) Frequency of rotor current at standstill (v) Frequency of rotor current at full load.                                                                                                                                                                                                                                                                                                                                                                                                       | 5M                | CO1       | L3        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>(OR)</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |           |           |      |    |    |                      |      |      |      |      |      |     |     |    |
| 3(a)                 | Illustrate the effects of Crawling and Cogging in 3-phase Induction Motor. How are they reduced?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5M                | CO1       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | A 3-phase Induction Motor runs at 1000 rpm at no-load 950 rpm at full load when supplied with power from 50 Hz supply. Determine (i) Number of poles (ii) %slip at full load (iii) Frequency of rotor current (iv) Rotor frequency at 10% slip.                                                                                                                                                                                                                                                                                                                                                                                                                      | 5M                | CO1       | L3        |      |    |    |                      |      |      |      |      |      |     |     |    |
| 4.                   | A 3-phase, 6-pole, 50Hz Y-connected Induction Motor has the following test results.<br>No-load test: 400V,9A,1250W<br>Short-circuit test: 200V, 50A, 6930W.<br>Draw Circle diagram, determine slip, power factor and efficiency.                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10M               | CO1       | L3        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>(OR)</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |           |           |      |    |    |                      |      |      |      |      |      |     |     |    |
| 5(a)                 | Derive the equation of starting torque of 3-phase Induction Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5M                | CO1       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Illustrate the various losses obtained in 3-phase Induction Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 5M                | CO1       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| 6(a)                 | Discuss the equivalent circuit of 1-phase Induction Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5M                | CO2       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Describe the operation of capacitor start – capacitor run Induction motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5M                | CO2       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>(OR)</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |           |           |      |    |    |                      |      |      |      |      |      |     |     |    |
| 7(a)                 | Show that a single-phase sinusoidal field can be replaced by two fields rotating around the air gap in opposite directions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M                | CO2       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Distinguish between split phase and shaded pole Induction Motors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5M                | CO2       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| 8(a)                 | Describe the constructional details of 3-phase Synchronous Generator.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5M                | CO3       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Discuss the importance of Synchronous Machine constants ( $X_d$ and $X_q$ ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 5M                | CO3       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>(OR)</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |           |           |      |    |    |                      |      |      |      |      |      |     |     |    |
| 9.                   | A 3-phase, 6000 V alternator has the following O.C.C. at normal speed: <table border="1"><tr><td>Field Current (A)</td><td>14</td><td>18</td><td>23</td><td>30</td><td>43</td></tr><tr><td>Terminal Voltage (V)</td><td>4000</td><td>5000</td><td>6000</td><td>7000</td><td>8000</td></tr></table> With armature short-circuited and full-load current flowing the field current is 17 A and when the machine is supplying full-load of 2,000 kVA at zero power factor, the field current is 42.5 A and the terminal voltage is 6,000 V. Determine the Voltage regulation by Potier triangle method when the machine is supplying the full-load at 0.8 p.f. lagging. | Field Current (A) | 14        | 18        | 23   | 30 | 43 | Terminal Voltage (V) | 4000 | 5000 | 6000 | 7000 | 8000 | 10M | CO3 | L3 |
| Field Current (A)    | 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 18                | 23        | 30        | 43   |    |    |                      |      |      |      |      |      |     |     |    |
| Terminal Voltage (V) | 4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5000              | 6000      | 7000      | 8000 |    |    |                      |      |      |      |      |      |     |     |    |
| 10(a)                | Illustrate the principle of operation of Synchronous Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5M                | CO4       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Derive the three-phase power developed in the Synchronous Motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5M                | CO4       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| <b>(OR)</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |           |           |      |    |    |                      |      |      |      |      |      |     |     |    |
| 11(a)                | Describe the starting of Synchronous Motor using damper windings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5M                | CO4       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |
| (b)                  | Illustrate the effect of constant mechanical load with variable excitation in synchronous motor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5M                | CO4       | L2        |      |    |    |                      |      |      |      |      |      |     |     |    |

**LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)**

L.B.Reddy Nagar :: Mylavaram - 521 230 :: NTR Dist. :: A.P.

**B.Tech. (IV Semester) Regular/Supplementary Examinations**

## 23ME08-THEORY OF MACHINES

(ME)

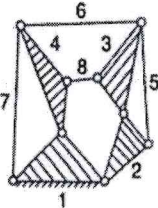
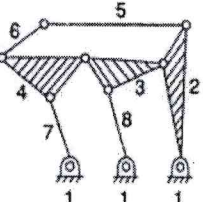
Time : 3 hours

Max. Marks : 70

| Q.No | Compulsory Question                                                  | Marks | CO  | BL |
|------|----------------------------------------------------------------------|-------|-----|----|
| 1(a) | List any two inversions of a four-bar chain. Explain any one.        | 2M    | CO1 | L1 |
| (b)  | What is the application of Hooke's joint?                            | 2M    | CO1 | L1 |
| (c)  | State Kennedy's theorem.                                             | 2M    | CO2 | L1 |
| (d)  | What are the components of acceleration in a rotating link?          | 2M    | CO2 | L1 |
| (e)  | Write the equation for static balancing of multiple rotating masses. | 2M    | CO3 | L1 |
| (f)  | Classify the followers based on their shape.                         | 2M    | CO3 | L1 |
| (g)  | Explain the concept of balancing of rotating masses.                 | 2M    | CO4 | L1 |
| (h)  | Explain the functions of cams.                                       | 2M    | CO4 | L1 |
| (i)  | Differentiate between natural and forced vibrations.                 | 2M    | CO5 | L1 |
| (j)  | What is the purpose of a flywheel?                                   | 2M    | CO5 | L1 |

| Q.No | All questions carry equal marks                                                                                                                                                                                                                                                                                                                                                             | Marks | CO  | BL |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----|
| 2(a) | Discuss about Whitworth quick return motion mechanism with a neat sketch.                                                                                                                                                                                                                                                                                                                   | 5M    | CO1 | L2 |
| (b)  | Find the ratio of time of cutting to time of return for a Whitworth quick return motion mechanism with the following assumptions: The length of the driving crank 150 mm. The distance between fixed centers is 100 mm. Consider that the line of stroke of the ram passes through the center of rotation of the slotted lever whose free end is connected to the ram by a connecting link. | 5M    | CO1 | L3 |

**(OR)**

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |     |    |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 3(a) | Explain about Elliptical trammel which is an inversion of a double slider crank chain with neat sketch .                                                                                                                                                                                                                                                                                                                                                           | 5M | CO1 | L2 |
| (b)  | For the kinematic linkages shown in figure (a)& (b) calculate the following. (i)The number of binary links (ii) The number of ternary links (iii) The number of quaternary links<br><br><div style="display: flex; justify-content: space-around; align-items: center;">   </div><br>(a) (b) | 5M | CO1 | L3 |

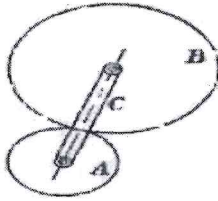
|      |                                                                                                                                                                                                                                                                                                                             |    |     |    |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 4(a) | Enumerate the procedure for the velocity diagram of 4 bar mechanism by assuming suitable proportions.                                                                                                                                                                                                                       | 5M | CO2 | L2 |
| (b)  | Locate all instantaneous centers of the slider crank mechanism; the length of crank OB and Connecting rod AB are 125 mm and 500mm respectively. The crank speed is 600 rpm clockwise. When the crank has turned $45^\circ$ from the IDC. Determine (i) velocity of slider 'A' (ii) Angular Velocity of connecting rod 'AB'. | 5M | CO2 | L3 |

(OR)

|      |                                                                                                                                                                                                                                                                          |    |     |    |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| 5(a) | <p>In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.</p> | 5M | C02 | L3 |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|



## 23ME08-THEORY OF MACHINES

|             |                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| (b)         | Explain with sketch the instantaneous center method for determination of velocities of links and mechanisms .                                                                                                                                                                                                                                                                 | 5M  | CO2 | L2 |
| 6(a)        | Explain the effect of gyroscope in aeroplane.                                                                                                                                                                                                                                                                                                                                 | 5M  | CO3 | L2 |
| (b)         | An aeroplane makes a complete half circle of 50 metres radius, towards left, when flying at 200 km per hr. The rotary engine and the propeller of the plane has a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates at 2400 r.p.m. clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it.             | 5M  | CO3 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
| 7(a)        | Explain the terms : (i) Module, (ii) Dedendum (iii) Addendum (iv) Circular pitch and (v) Backlash.                                                                                                                                                                                                                                                                            | 5M  | CO3 | L2 |
| (b)         | The figure shows a single epicyclic gear. The wheel A is stationary. Calculate the speed of C when B rotates about its own axis at 100rpm. The number of teeth on A and B are 120 and 45 respectively.<br>                                                                                   | 5M  | CO3 | L3 |
| 8.          | Four masses $m_1$ , $m_2$ , $m_3$ and $m_4$ are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are $45^\circ$ , $75^\circ$ and $135^\circ$ . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. | 10M | CO4 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
| 9.          | Describe the construction and working of a cam profile for a knife-edge follower.                                                                                                                                                                                                                                                                                             | 10M | CO4 | L2 |
| 10(a)       | Derive the expression for natural frequency of undamped free vibrations of a single degree of freedom system.                                                                                                                                                                                                                                                                 | 5M  | CO5 | L3 |
| (b)         | A vibrating system has a damping coefficient of 40 N·s/m. If the critical damping coefficient is 100 N·s/m, find the damping ratio and state the type of damping.                                                                                                                                                                                                             | 5M  | CO5 | L3 |
| <b>(OR)</b> |                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
| 11(a)       | Explain the significance of the turning moment diagram in the analysis of flywheels. How is it used to determine energy fluctuation?                                                                                                                                                                                                                                          | 5M  | CO5 | L2 |
| (b)         | The turning moment diagram of an engine running at 600 rpm has areas between the torque curve and mean resistance line (in $\text{mm}^2$ ) as: +50, -120, +90, -100, +80. If the scale is 1 mm = 600 N·m (torque) and 1 mm = $3^\circ$ (angle), determine the maximum fluctuation of energy.                                                                                  | 5M  | CO5 | L3 |

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