



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. (V Semester) (R23) Semester End Examinations (Supplementary) June 2026

TIME TABLE

R23

Time : 02.00 PM to 05.00 PM

A.Y. : 2025-26

Branch	02-06-2026 (Tuesday)	03-06-2026 (Wednesday)	04-06-2026 (Thursday)	05-06-2026 (Friday)	06-06-2026 (Saturday)	08-06-2026 (Monday)
					Open Elective - I	Program Elective - I
AI & DS	Minor 23ADM1-Introduction To Artificial Intelligence and Data Science (ASE, ECE & ME) 23AMM1-Principles of Artificial Intelligence (ASE & EEE) 23CSM4-Introduction to Database systems (CE, ECE, EEE & ME)	23AD04-Data Warehousing and Data Mining	23AM03-Principles of Machine Learning	23AD05-Data Visualization	23ME81- Sustainable Energy Technologies	23AD07-Exploratory Data Analysis with Python
ASE		23AE07-Aerospace Vehicle Structures	23AE08-Gas Dynamics	23AE09-Aircraft Systems and Instruments	23EC85- Fundamentals of Satellite Communications	23AE11- Finite Element Analysis
CE		23CE08-Design and Drawing of Reinforced Concrete Structures	23CE09-Engineering Hydrology	23CE10-Geotechnical Engineering-I	23ME81- Sustainable Energy Technologies	23CE13-Construction Technology and Management
CSE		23AD04-Data Warehousing and Data Mining	23CS07-Computer Networks	23CS08-Formal Languages and Automata Theory	23ME81- Sustainable Energy Technologies	23AD02-Artificial Intelligence
CSE (AI&ML)		23AM02-Information Retrieval Systems	23CS07-Computer Networks	23CS06-Operating Systems	23ME81- Sustainable Energy Technologies	23CS11-Cloud Computing
ECE		23EC08-Analog & Digital IC Applications	23EC09-Digital Communications	23EC10-Antennas and Wave Propagation	23AM81-Python Programming for AI & ML	23EC12- Digital System Design through HDL
EEE		23EE10-Power Electronics	23EE11-Digital Circuits	23EE12-Power Systems-II	23AD82-Fundamentals of Data Science	23EC27- Communication systems
IT		23IT04-Advanced Java	23CS07-Computer Networks	23CS12-Automata Theory & Compiler Design	23ME82- Introduction to Industrial Robotics 23EC85-Fundamentals of Satellite Communications	23AD02-Artificial Intelligence
ME		23ME10-Machine Tools and Metrology	23ME11-Thermal Engineering	23ME12-Design of Machine Elements	23EE84-Electric Vehicles	23ME16-Industrial Robotics

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

Date: 16 MAY 2026

CONTROLLER OF EXAMINATIONS

PRINCIPAL

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B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23AD04-DATA WAREHOUSING AND DATA MINING**

(AI&DS and CSE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL																				
1(a)	Explain about ordinal attribute in a data warehousing with a suitable example.	2M	CO1	L2																				
(b)	Explain the concepts of Data cleaning in a data warehouse with suitable examples.	2M	CO1	L2																				
(c)	What is data cube aggregation?	2M	CO2	L2																				
(d)	Define data integration. Why is schema matching important?	2M	CO2	L2																				
(e)	Explain Gini Index with an example.	2M	CO3	L2																				
(f)	Explain Bayesain classifiers with an example.	2M	CO3	L2																				
(g)	Explain support and confidence in association rule mining with an example.	2M	CO4	L2																				
(h)	What is meant by "rule generation" in the Apriori algorithm?	2M	CO4	L2																				
(i)	Explain the K-Means++ initialization algorithm with an example.	2M	CO5	L2																				
(j)	Differentiate strengths and Weakness of DBSCAN.	2M	CO5	L2																				
Q.No	All questions carry equal marks	Marks	CO	BL																				
2(a)	Demonstrate all OLAP operations.	5M	CO1	L3																				
(b)	Briefly outline how to compute the dissimilarity between objects described by the following: (i) Nominal attributes (ii) Asymmetric binary attributes.	5M	CO1	L4																				
(OR)																								
3(a)	Explain the data warehouse implementation.	5M	CO1	L3																				
(b)	Demonstrate operational database systems and data warehousing.	5M	CO1	L3																				
4(a)	How can we smooth out noise in data cleaning process? Explain.	5M	CO2	L3																				
(b)	Normalize the following group of data by using the following techniques. 200, 300, 400, 600, 1000. (i) z-score normalization using the mean absolute deviation instead of standard deviation (ii) normalization by decimal scaling	5M	CO2	L3																				
(OR)																								
5(a)	What is data reduction? What is dimensionality reduction? What is lossless and lossy dimensionality reduction?	5M	CO2	L3																				
(b)	Describe Data Transformation & Data Discretization.	5M	CO2	L3																				
6(a)	Why information gain is considered as attribute selection measure? Illustrate with an example.	5M	CO3	L3																				
(b)	Explain the classification by decision tree induction.	5M	CO3	L3																				
(OR)																								
7.	For the given dataset, apply Naïve Bayesian Algorithm and predict if a fruit has following properties then which type of fruit it is {yellow, sweet, long}.	10M	CO3	L3																				
	<table border="1"> <thead> <tr> <th>Fruit</th><th>Yellow</th><th>Sweet</th><th>Long</th><th>Total</th></tr> </thead> <tbody> <tr> <td>Lemon</td><td>35</td><td>40</td><td>0</td><td>65</td></tr> <tr> <td>Date palm</td><td>40</td><td>30</td><td>35</td><td>40</td></tr> <tr> <td>Watermelon</td><td>5</td><td>10</td><td>5</td><td>15</td></tr> </tbody> </table>	Fruit	Yellow	Sweet	Long	Total	Lemon	35	40	0	65	Date palm	40	30	35	40	Watermelon	5	10	5	15			
Fruit	Yellow	Sweet	Long	Total																				
Lemon	35	40	0	65																				
Date palm	40	30	35	40																				
Watermelon	5	10	5	15																				
8(a)	Discuss the confidence-based pruning technique used in association rule mining.	5M	CO4	L3																				
(b)	Write and explain the steps for frequent itemset generation and rule generation in association analysis.	5M	CO4	L3																				
(OR)																								
9(a)	Discuss the limitations of Apriori and how FP-Growth overcomes them.	5M	CO4	L4																				
(b)	Illustrate the process of building an FP-tree and extracting frequent patterns using FP-Growth.	5M	CO4	L4																				
10(a)	Compare and contrast the advantages and disadvantages of K-means and bisecting K-means in terms of performance and quality of clustering results.	5M	CO5	L4																				
(b)	Write about Min, Max, and Average links used in clusterings.	5M	CO5	L3																				
(OR)																								
11(a)	How to implement Density Center-Based Approach using DBSCAN algorithm? Explain.	5M	CO5	L4																				
(b)	Consider five points {X1, X2, X3, X4, X5} with the following coordinates as a two dimensional sample for clustering : X1 = (0.5,2.5); X2 = (0,0); X3 = (1.5,1); X4 = (5,1); X5 = (6,2) Illustrate the K-means partitioning algorithms using the above data set.	5M	CO5	L4																				

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

23AE07-AEROSPACE VEHICLE STRUCTURES

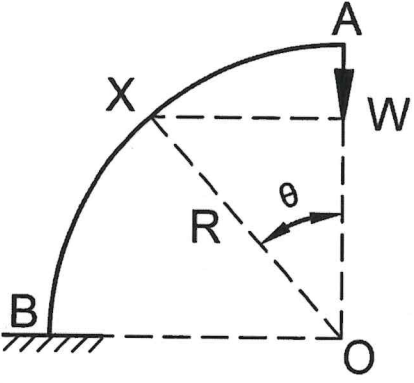
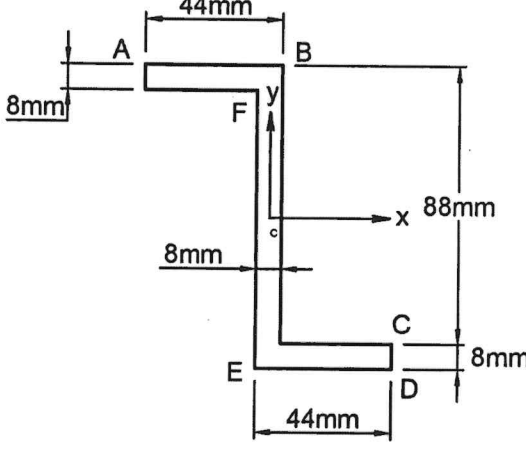
(ASE)

Time : 3 hours

Max. Marks : 70

Q.No.	Compulsory Question	Marks	CO	BL
1(a)	What is the generalized Hooke's law for a 3D elastic body?	2M	CO1	L1
(b)	State Maximum Stress Theory (Rankine).	2M	CO1	L1
(c)	Draw the support conditions of: (i) Fixed-fixed beam (ii) Propped cantilever.	2M	CO2	L2
(d)	What are the advantages of indeterminate structures in aerospace design?	2M	CO2	L1
(e)	Define unit load method.	2M	CO3	L1
(f)	List the functions of stringers in an aircraft fuselage.	2M	CO3	L1
(g)	Differentiate between short and long columns.	2M	CO4	L2
(h)	Define slenderness ratio.	2M	CO4	L1
(i)	What is the significance of product of inertia in unsymmetrical bending?	2M	CO5	L1
(j)	Illustrate the concept of skew load with an example.	2M	CO5	L2
(OR)				
Q.No.	All questions carry equal marks	Marks	CO	BL
2(a)	Derive the equations of equilibrium for the three-dimensional stress system.	5M	CO1	L3
(b)	The major principal stress on an element of a steel member is 230 MPa and the minor principal stress is compressive. If tensile yield point of steel is 300 MPa, find the minor principal stress at which failure will occur, according to Maximum distortion energy theory of failure. Take Poisson's ratio $\mu = 0.25$.	5M	CO1	L3
(OR)				
3(a)	Check whether the Airy's stress function $\phi = Ax^2 + Bx^2y + Cy^3 + D(5x^2y^3 - y^5)$ for a given problem is valid or not.	5M	CO1	L3
(b)	Summarize main differences between Maximum Shear Stress Theory and Distortion Energy Theory.	5M	CO1	L3
(OR)				
4(a)	Differentiate between statically determinate and statically indeterminate structures.	5M	CO2	L2
(b)	Evaluate the prop reaction of a cantilever of length 5M carries a uniformly distributed load of 48 kN/m. The cantilever is propped rigidly at the free end.	5M	CO2	L3
(OR)				
5.	State Clapeyron's theorem of three moments and derive the three-moment equation for a continuous beam.	10 M	CO2	L3
(OR)				
6(a)	Discuss the structural components of an aircraft.	5M	CO3	L2
(b)	A cantilever of length 'l' carries a uniformly distributed load of 'w' per unit run. Find the strain energy stored by the cantilever.	5M	CO3	L3
(OR)				
7(a)	Discuss the various types of loads acting on an aircraft during flight and ground conditions.	5M	CO3	L2

23AE07-AEROSPACE VEHICLE STRUCTURES

(b)	Find the strain energy stored by the quadrantal ring AB of radius R shown in figure. Hence calculate the vertical deflection of the end A. 	5M	CO3	L3
8(a)	Derive the expression for crippling load by Euler's theory for a column having one end fixed and another end free.	5M	CO4	L3
(b)	Explain Rankine's Formula for both short and long column.	5M	CO4	L2
(OR)				
9.	Evaluate the crippling of a 1.5M long column has a circular cross section of 5 cm diameter. One of the ends of the Column is fixed in direction and position and other end is free. Taking factor of Safety as 3, calculate the safe load, Take $\sigma_c = 560 \text{ N/mm}^2$ and $\alpha = 1/1600$ in Rankine's formula.	10M	CO4	L3
10(a)	Differentiate between symmetrical and unsymmetrical bending of beams.	5M	CO5	L2
(b)	A beam of Z- section shown in figure subjected to bending moment $M_y = 10 \text{ kN-m}$. Calculate direct stresses due to bending at points B and E. Take, $I_{xx} = 1.7080 \times 10^6 \text{ mm}^4$, $I_{yy} = 0.3450 \times 10^6 \text{ mm}^4$, and $I_{xy} = 0.5575 \times 10^6 \text{ mm}^4$. 	5M	CO5	L3
(OR)				
11.	Derive the direct stress (σ_z) distribution equation for a beam with an unsymmetrical cross-section.	10M	CO5	L3

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

23CE08-DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES
(CE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define characteristic load.	2M	CO1	L1
(b)	Determine modular ratio for M30 grade concrete and Fe415 steel.	2M	CO1	L1
(c)	List the limit state of serviceability checks in design of reinforced concrete structures.	2M	CO1	L1
(d)	Determine the maximum tension reinforcement for a beam 300mm x 500mm effective depth. Take M25 grade concrete and Fe415 steel.	2M	CO1	L1
(e)	State the IS provisions for maximum spacing of shear reinforcement.	2M	CO1	L1
(f)	Calculate the development length for mild steel of M30 grade concrete in compression.	2M	CO1	L1
(g)	Classify the columns according to their dimensions.	2M	CO1	L1
(h)	State the IS provisions to fix the diameter of transverse reinforcement.	2M	CO1	L1
(i)	Calculate the total ultimate load a slab having 150mm overall depth. Take live load 3kN/m ² and finishing load 1kN/m ² .	2M	CO1	L1
(j)	Define one-way slab.	2M	CO1	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain stress strain curve for mild steel.	5M	CO1	L2
(b)	Explain the terms balanced section, under-reinforced section, and over-reinforced section in working stress method.	5M	CO1	L2
(OR)				
3(a)	Derive the stress block parameters in limit state method.	5M	CO2	L2
(b)	A reinforced concrete beam of rectangular section 300mm x 600mm is reinforced with 4 bars of 32mm diameter at an effective depth of 550mm. Determine moment of resistance by using M20 grade concrete and Fe415 steel. Use working stress method.	5M	CO2	L3
4.	Design a T beam for the following data; Breadth of flange = 750mm Width of web = 250mm Effective depth = 500mm Depth of flange = 90mm Applied moment = 250kN.m Use M25 grade concrete and Fe415 steel.	10M	CO2	L4
(OR)				
5.	Design a doubly reinforced beam 350 mm wide and 500 mm deep of M25 grade concrete to resist an ultimate moment of 350 kN-m. Use Fe 415 bars & sketch the reinforcement details.	10M	CO2	L4
6.	A rectangular beam of 240 mm wide & 500 mm effective depth is reinforced with 3 bars of 20 mm diameter at supports. Design shear reinforcement in the form of inclined stirrups if it carries a shear force of 200 kN at service condition. Use M25 grade concrete and Fe 415 steel.	10M	CO3	L4
(OR)				
7.	A rectangular beam of 300mm wide & 500mm effective depth is reinforced with 4 bars 25mm diameter at supports. Design shear reinforcement if it carries a ultimate shear force of 180kN. Use M35 grade concrete and Fe 415 steel.	10M	CO3	L4
8.	Design a short column to carry a working load of 2000kN and uniaxial moment of 200 kN.m. Assume M20 mix Fe 415 steel.	10M	CO4	L4
(OR)				
9.	Design an isolated footing for a column of 400mm x 550 mm transmitting a load of 1500 kN axially. The column is reinforced with 10 bars of 16 mm diameter. Take SBC of soil is 150kN/m ² . Use M25 grade concrete and Fe415 steel.	10M	CO4	L4
10.	Design a R.C.C slab for a room having inside dimensions 3 m X 7 m. The thickness of supporting wall is 300 mm. Assume that the slab is simply supported at ends. Take M20 grade concrete and Fe 415 steel.	10M	CO5	L4
(OR)				
11.	Design a reinforced concrete slab for a classroom having inside dimensions 3.5M X 6.5M. The slab carries a 100 mm thick lime concrete at its top, having the unit weight of 20 kN/m ³ . Assume that the two short edges of the slab are discontinued while the long edges are continued. Take M25 grade concrete and Fe 415 steel.	10M	CO5	L4

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

23AM02-INFORMATION RETRIEVAL SYSTEMS

(CSE(AI&ML))

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define domain analysis in the context of an Information Retrieval System.	2M	CO1	L1
(b)	Name the main components involved in IR Model.	2M	CO1	L1
(c)	What are inverted files, and how are they used in Information Retrieval Systems?	2M	CO2	L1
(d)	Expand the steps involved in building an inverted file using a sorted array.	2M	CO2	L1
(e)	What are PAT trees, and how are they useful in text indexing?	2M	CO3	L1
(f)	Explain the process of lexical analysis in the context of building indices for text.	2M	CO3	L2
(g)	How stemming algorithms are used to Retrieve Information?	2M	CO4	L1
(h)	List different types of stemming algorithms with suitable examples.	2M	CO4	L1
(i)	Recall the purpose of string searching algorithms in Information Retrieval.	2M	CO5	L1
(j)	Show the importance of the preliminary concepts required to understand string searching algorithms.	2M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain the role of domain analysis in the design and development of an Information Retrieval System.	5M	CO1	L2
(b)	Illustrate different types of Information Systems with a neat diagram.	5M	CO1	L3
(OR)				
3(a)	Apply the concept of precision and recall to evaluate the effectiveness of a given Information Retrieval System dataset.	5M	CO1	L3
(b)	Build a simple inverted index structure for a set of five documents.	5M	CO1	L3
4.	Explain the various structures used in inverted files and their roles in information retrieval systems.	10M	CO2	L2
(OR)				
5(a)	Differentiate between vertical partitioning and horizontal partitioning in IR.	5M	CO2	L2
(b)	Discuss how building an inverted file using a sorted array impacts the efficiency of search operations.	5M	CO2	L2
6(a)	Explain the importance of lexical analysis in the construction of efficient Information Retrieval systems.	5M	CO3	L2
(b)	Illustrate the process of creating new indices for text documents with an example.	5M	CO3	L3
(OR)				
7(a)	Apply the concept of stop lists to filter irrelevant terms during text indexing.	5M	CO3	L3
(b)	Build a basic PAT tree using a given set of words and demonstrate the steps involved.	5M	CO3	L3
8(a)	Explain the role of stemming algorithms in improving the effectiveness of information retrieval systems.	5M	CO4	L2
(b)	Illustrate the working process of the Porter stemming algorithm with a suitable example.	5M	CO4	L3
(OR)				
9.	Apply stemming techniques to compress inverted files and demonstrate how storage space can be reduced.	10M	CO4	L4
10(a)	Explain the significance of string searching algorithms in information retrieval systems.	5M	CO5	L2
(b)	Illustrate the step-by-step working of the Knuth-Morris-Pratt (KMP) algorithm with a suitable example.	5M	CO5	L3
(OR)				
11(a)	Apply the Boyer-Moore algorithm to search for a given pattern in a sample text and show the matching steps.	5M	CO5	L3
(b)	Build a flowchart that represents the process of the Naive string-matching algorithm.	5M	CO5	L3

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

23EC08-ANALOG & DIGITAL IC APPLICATIONS

(ECE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	What is the output voltage of Inverting amplifier?	2M	CO1	L1
(b)	Define of upper and lower threshold points of a Schmitt trigger.	2M	CO1	L1
(c)	List the application of Astable Multivibrator.	2M	CO2	L1
(d)	Draw the circuit and frequency response curve of Band reject circuit.	2M	CO2	L1
(e)	Compare the DAC and ADC.	2M	CO3	L1
(f)	What are the disadvantages of DAC?	2M	CO3	L1
(g)	Mention applications of multiplexer IC.	2M	CO4	L1
(h)	Draw 2 to 4 decoder circuit.	2M	CO4	L1
(i)	What is a flip flop?	2M	CO5	L1
(j)	Differentiate Static and Dynamic RAMs.	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Discuss the advantages of Integrated Circuits.	5M	CO1	L2
(b)	What is slew rate? An operational amplifier is required to amplify a signal with a peak voltage of 5 volts at a frequency of 20kHz. Find out a slew rate.	5M	CO1	L3
(OR)				
3.	Determine the voltage gain of instrumentation amplifier and give the important features and applications.	10M	CO1	L3
4(a)	Analyze the first order Butterworth high pass filter and draw its frequency response.	5M	CO2	L4
(b)	Design Butterworth filter of first order low pass with a maximum gain of 9 and cut off frequency is 1 Khz. Plot the frequency response curve.	5M	CO2	L3
(OR)				
5(a)	Build the Astable multivibrator by using 555 Timer with functional diagram and waveforms.	5M	CO2	L2
(b)	Derive the frequency of oscillation of Astable multivibrator using 555 timer.	5M	CO2	L3
6(a)	Discuss the working principle of 3 bit DAC with circuit.	5M	CO3	L2
(b)	Design 4 bit R-2R ladder DAC, the reference voltage is 10 V and the resolution required is 0.5 V.	5M	CO3	L3
(OR)				
7(a)	Discuss the working of flash comparator type ADC with diagram.	5M	CO3	L2
(b)	A 8 bit ADC outputs are all 1's when $V_i = 5.1$ V. Find it's (i) Resolution (ii) Digital output when $V_i = 1.28$ V.	5M	CO3	L3
8(a)	Compare TTL-74XX & CMOS 40XX Series ICs.	5M	CO4	L2
(b)	Explain about the operation of Decoder by using 74x138 IC.	5M	CO4	L2
(OR)				
9(a)	What are the limitations of Encoder? How it overcome by Priority encoder and discuss the operation of Priority encoder 74x148IC.	5M	CO4	L2
(b)	Implement 16 X 1 Multiplexer using Two 8 X 1 Multiplexers(74LS151).	5M	CO4	L3
10(a)	Explain the SR flip flop and derive the characteristic equation of SR flip flop.	5M	CO5	L2
(b)	Discuss the function of the Johnson Counter IC74LS164.	5M	CO5	L2
(OR)				
11(a)	Design a 4 bit binary synchronous counter using 74X74.	5M	CO5	L3
(b)	Explain in brief about ROM family. List the applications.	5M	CO5	L2

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B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23IT04-ADVANCED JAVA**

(IT)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define ResultSet and its purpose in JDBC.	2M	CO1	L2
(b)	List the types of statements in JDBC.	2M	CO1	L2
(c)	What is J2EE and list its main components?	2M	CO2	L2
(d)	Explain Web Application Structure.	2M	CO2	L2
(e)	Define ServletContext and its use.	2M	CO3	L2
(f)	How does a Servlet create a Cookie?	2M	CO3	L2
(g)	List any two JSP implicit objects.	2M	CO4	L2
(h)	What are JSP directives? Give examples.	2M	CO4	L2
(i)	What is the purpose of Spring DAO?	2M	CO5	L2
(j)	List the scopes of a Spring Bean.	2M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain types of statements in JDBC with suitable examples.	5M	CO1	L2
(b)	Write a program to perform batch updates in JDBC.	5M	CO1	L3
(OR)				
3(a)	Compare and contrast the four types of JDBC drivers with suitable diagrams and advantages, disadvantages.	5M	CO1	L2
(b)	Write a CRUD application using JDBC.	5M	CO1	L3
4.	Describe the role of J2EE containers in providing system-level services such as security, transaction management, and naming. Explain with suitable examples.	10 M	CO2	L3
(OR)				
5(a)	Explain web architecture models in J2EE.	5M	CO2	L2
(b)	Describe the request processing flow in web applications.	5M	CO2	L3
6(a)	Discuss the use of filters in Servlet programming.	5M	CO3	L2
(b)	Develop a web application using Servlet and JDBC to authenticate a user and store the username in a session.	5M	CO3	L3
(OR)				
7(a)	Explain the working of Request Dispatcher.	5M	CO3	L2
(b)	Write a Servlet to demonstrate session tracking using Http Session object.	5M	CO3	L3
8(a)	Explain JSP action tags with examples.	5M	CO4	L2
(b)	Develop a JSP page using JSTL to display employee data.	5M	CO4	L3
(OR)				
9.	Write a JSP page to insert and read Student data into a database.	10M	CO4	L3
10(a)	Explain Spring MVC architecture and dispatcher servlet.	5M	CO5	L2
(b)	Develop a Spring MVC Controller (using @Controller) that handles a request to authenticate a user by username and password using arrays and welcome user.	5M	CO5	L3
(OR)				
11(a)	Discuss Spring bean scopes and annotations.	5M	CO5	L2
(b)	Write a note on Spring JDBC Template.	5M	CO5	L3

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B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23ME10-MACHINE TOOLS AND METROLOGY**

(ME)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Which type of tools are used in the metal cutting process?	2 M	CO1	L1
(b)	Recognize any two taper turning methods.	2 M	CO1	L3
(c)	State the slotting machine operations.	2 M	CO2	L1
(d)	When did you use the boring machine operations in automobile components?	2 M	CO2	L3
(e)	Calculate the indexing movement of cylindrical job of 5 equal division using simple indexing method.	2 M	CO3	L3
(f)	Write the broaching machine types.	2 M	CO3	L1
(g)	State various assembly systems.	2 M	CO4	L1
(h)	List out linear measuring instruments.	2 M	CO4	L1
(i)	Name any four instruments used for angular measurement.	2 M	CO5	L1
(j)	State the function of an optical projector.	2 M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2.	Analyse the chip formation in the metal cutting process, and write the various types of chips formed in the machining process.	10 M	CO1	L4
(OR)				
3(a)	List parts of the lathe machine and explain the tail stock and headstock importance in the lathe machine with a neat sketch.	5M	CO1	L2
(b)	Confer work holding devices used on Lathe machines.	5M	CO1	L2
4.	Explain with the help of a line diagram construction, working principle, and important parts of a shaper machine.	10 M	CO2	L2
(OR)				
5(a)	With a neat diagram, discuss the working principle of the drilling machine.	5 M	CO2	L2
(b)	Distinguish between shaper machine and planer machine.	5 M	CO2	L2
6(a)	Demonstrate with the help of a line diagram of a milling machine.	5 M	CO3	L3
(b)	Summarize the Lapping and Honing process with suitable diagrams.	5 M	CO3	L2
(OR)				
7.	A typical grinding wheel is specified as: 36-A-60-H-5-V-8. Examine the different terms used in specifying the above grinding wheel.	10M	CO3	L3
8(a)	Analyse different types of fits used in engineering practice with neat sketches.	5 M	CO4	L3
(b)	Explain clearly what is meant by Selective assembly, when it is used.	5 M	CO4	L2
(OR)				
9(a)	Distinguish between 'Hole basis system' and 'Shaft basis system' of fits.	5M	CO4	L2
(b)	With the help of a neat sketch shows the construction and working of the dial indicator.	5M	CO4	L2
10(a)	Elucidate construction of the Tools maker's microscope.	5M	CO5	L2
(b)	The measurement of surface roughness the height of 10 successive peaks and valleys over datum line over a specified sampling length were found to be; Peaks: 50, 45, 45, 55, 52 Valleys: 35, 35, 34, 28, 40 Solve the Rz value of the surface.	5M	CO5	L3
(OR)				
11(a)	Explain the spirit level measuring instrument in the machine shop, with a neat sketch.	5M	CO5	L2
(b)	In the measurement of surface roughness, heights of 20 successive peaks and troughs were measured from a datum and were 35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35 and 20 microns. If these measurements were obtained over a length of 20 mm. Determine the CLA and RMS value of the rough surface.	5M	CO5	L3

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

23AM03-PRINCIPLES OF MACHINE LEARNING
(AI&DS)

Time : 3 hours

Max. Marks :70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define Machine Learning.	2M	CO1	L2
(b)	What does 'Feature Engineering' mean in simple terms?	2M	CO1	L2
(c)	Find the Manhattan distance between two data points: P1(1, 5, 3) and P2(4, 1, 6).	2M	CO2	L1
(d)	List out types of classification methods using distance.	2M	CO2	L1
(e)	Define the term 'Impurity' in the context of a decision tree node. Name two common impurity measures.	2M	CO3	L1
(f)	What is the primary goal of the 'Bias-Variance Trade-off' in machine learning?	2M	CO3	L1
(g)	Identify the primary objective that differentiates the optimization goal of a Support Vector Machine (SVM).	2M	CO4	L1
(h)	Given a linear discriminant function $f(x) = 2x_1 + 3x_2 - 6$, determine the class label for the data point (1, 2).	2M	CO4	L1
(i)	Differentiate between Bagging and Boosting based on the training data sampling method.	2M	CO5	L1
(j)	How does Bagging help in reducing the variance of a model?	2M	CO5	L1
(OR)				
2(a)	Describe the process of "Learning by Induction" with a suitable example.	5M	CO1	L2
(b)	Discuss the challenges and best practices involved in the 'Data Acquisition' stage for an ML project.	5M	CO1	L2
(OR)				
3(a)	Outline the major Stages in the Machine Learning lifecycle.	5M	CO1	L2
(b)	Explain the evolution of Machine Learning.	5M	CO1	L2
4.	Demonstrate how a weighted k-NN algorithm works differently from a standard k-NN algorithm. Use a simple example with $k=3$ and three classes to show how weighting can change the predicted outcome.	10M	CO2	L3
(OR)				
5(a)	Given two binary feature vectors, $A = [1, 0, 1, 0, 1]$ and $B = [1, 1, 0, 0, 1]$ calculate their similarity using the Jaccard coefficient.	5M	CO2	L3
(b)	Define the term 'proximity measure' and state the key difference between a distance measure and a non-metric similarity function.	5M	CO2	L2
6(a)	Discuss the step-by-step process of building a decision tree for classification.	5M	CO3	L2
(b)	Compare the Naive Bayes Classifier with a Logistic Regression model.	5M	CO3	L2
(OR)				
7(a)	Describe the architecture and working principle of a Random Forest for classification.	5M	CO3	L3
(b)	Discuss three key properties of decision trees that make them popular, and also mention three main limitations of decision trees.	5M	CO3	L2
8(a)	Illustrate how the Perceptron Learning Algorithm is applied to a simple dataset step-by-step.	5M	CO4	L3
(b)	Describe the logistic regression mathematical equation with an example.	5M	CO4	L2
(OR)				
9.	Design the architecture of a Multi-Layer Perceptron (MLP) for a multi-class classification problem with 4 input features and 3 possible output classes.	10 M	CO4	L3
10(a)	Discuss the workflow of Stacking (Stacked Generalization) ensemble method with a neat diagram.	5M	CO5	L2
(b)	Discuss the role of Regularization in controlling model complexity within the XGBoost algorithm.	5M	CO5	L2
(OR)				
11(a)	Describe the concept of Gradient in Gradient Boosting Machines (GBM).	5M	CO5	L2
(b)	Describe the step-by-step process of how a Q-Learning agent updates its Q-table and learns the optimal policy in a deterministic environment.	5M	CO5	L2

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

23AM03-PRINCIPLES OF MACHINE LEARNING
(AI&DS)

Time : 3 hours

Max. Marks :70

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

23AE08-GAS DYNAMICS

(ASE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	What is the relation to determine speed of sound of perfect gas?	2 M	CO1	L2
(b)	What is the compressible Bernoulli's equation?	2 M	CO1	L2
(c)	How to generate supersonic flow?	2 M	CO2	L2
(d)	What is meant by overexpanded condition?	2 M	CO2	L2
(e)	What is the possible range of oblique shock wave angle for a given initial Mach number (M_1)?	2 M	CO3	L2
(f)	What is the difference between Normal shock wave and Oblique shock wave?	2 M	CO3	L2
(g)	Define Fanno flow.	2 M	CO4	L1
(h)	Write the expression for critical pressure ratio for Fanno flow.	2 M	CO4	L2
(i)	What is meant by drag-divergence Mach number?	2 M	CO5	L1
(j)	What are considerations for linearization of velocity potential equation?	2 M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Air flows through a frictional diffuser. At a station in the diffuser the temperature, pressure and velocity are 0° Celsius, 140 kPa and 900m/s, respectively and at a downstream station the velocity decreases to 300 m/s. Assuming the flow to be adiabatic, calculate the increase in pressure and temperature of the flow between these stations.	5 M	CO1	L3
(b)	Derive the expression for speed of sound for perfect gas under isentropic conditions.	5 M	CO1	L3
(OR)				
3(a)	Hydrogen gas in a cylinder at 7 atm and 300 K is expanded isentropically through a nozzle to a final pressure of 1 atm. Assuming Hydrogen to be perfect gas with specific heats ratio $\gamma=1.4$, determine the velocity and Mach number corresponding to the final pressure.	5 M	CO1	L3
(b)	Derive the relations among stagnation, static, and Mach number for a perfect gas with isentropic flow process.	5 M	CO1	L3
4.	Illustrate flow processs through convergent nozzle and convergent-divergent nozzle with the change of pressure ratio across them.	10 M	CO2	L2
(OR)				
5(a)	Derive the compressible Bernoulli's equation.	5M	CO2	L3
(b)	Derive the expression for compressibility correction to dynamic pressure.	5M	CO2	L3
6(a)	Consider a normal shock wave in air where upstream flow velocity $V_1 = 680$ m/s, upstream temperature $T_1 = 288$ K and upstream pressure $P_1 = 1$ atm. Calculate the velocity, temperature and pressure downstream of the shock wave.	5M	CO3	L3

23AE08-GAS DYNAMICS

(b)	Show that for a perfect gas, the Mach number behind the oblique shock (M_2) is a function of Mach number ahead of the shock (M_1), Shock angle (β) and flow deflection angle (θ).	5M	CO3	L3
(OR)				
7.	Derive the relation among Mach number ahead of the oblique shock (M_1), Shock angle (β) and flow deflection angle (θ).	10M	CO3	L3
8(a)	Air flows through an insulated duct of diameter 30 mm. Determine the duct length required to accelerate the flow from (i) 0.2 to 0.5 and (ii) 0.2 to 1.0. The average friction factor for the duct is 0.025.	5 M	CO4	L3
(b)	Describe the effect of heat transfer on downstream flow for subsonic and supersonic inlet flow on velocity, Mach number, pressure, temperature, density, stagnation pressure and station temperature.	5 M	CO4	L2
(OR)				
9(a)	Argon gas enters an insulated, constant area duct with a Mach number of 0.6, static pressure 90 kPa, and static temperature 300K. The diameter is 30 cm and length is 1.9 m. If the average friction factor for the duct is 0.02, Determine the Mach number, pressure, and temperature at the duct exit.	5 M	CO4	L3
(b)	Hydrogen gas enters an insulated tube of 25 mm diameter with velocity $V_1 = 200$ m/s and pressure $P_1 = 250$ kPa and temperature $T_1 = 303$ K. What is the length of the tube required for this flow to choke? The average friction factor for this tube is 0.03.	5M	CO4	L3
10.	Express the coefficient pressure in terms of perturbed velocity and freestream velocity.	10M	CO5	L3
(OR)				
11(a)	Consider the NACA 0012 airfoil at zero angle of attack. The minimum value of pressure co-efficient on the surface is -0.43 . Estimate the critical Mach number of this airfoil.	5M	CO5	L3
(b)	What is area-rule? Describe briefly the importance of area rule.	5M	CO5	L2

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

23CS07-COMPUTER NETWORKS

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

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	What is the difference between guided and unguided media?	2M	CO1	L1
(b)	Which network devices operate at the Physical layer? List their functionalities.	2M	CO1	L1
(c)	Write short notes on piggybacking in flow control.	2M	CO2	L2
(d)	What is the primary function of the data link layer?	2M	CO2	L1
(e)	Explain the vulnerable period in a Pure ALOHA network.	2M	CO3	L2
(f)	What is the purpose of Multiple Access Control (MAC) protocols?	2M	CO3	L1
(g)	Explain the Optimality Principle used in routing.	2M	CO4	L2
(h)	List the reasons for congestion and give remedies to it.	2M	CO4	L1
(i)	Explain the HTTP protocol and its operations (Request/Response).	2M	CO5	L2
(j)	Write a short note on TELNET.	2M	CO5	L2
(OR)				
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Compare bus, ring, and star topologies.	5M	CO1	L3
(b)	Explain network topologies with neat diagrams.	5M	CO1	L2
(OR)				
3(a)	List and explain the functions of each OSI layer.	5M	CO1	L2
(b)	Explain the advantages and disadvantages of optical fiber over copper media.	5M	CO1	L3
(OR)				
4.	Describe the Go-Back-N ARQ and Selective Repeat ARQ protocols with timing diagrams and performance comparison.	10M	CO2	L3
(OR)				
5(a)	Explain Pure ALOHA and Slotted ALOHA with diagrams.	5M	CO3	L2
(b)	Describe Carrier Sense Multiple Access (CSMA) and its types.	5M	CO3	L2
(OR)				
6(a)	A network uses TDMA with 10 stations, each transmitting 1000 bits/sec. Calculate the total throughput and discuss its efficiency compared to FDMA.	5M	CO3	L2
(b)	What is Ethernet? Explain its frame format.	5M	CO3	L2
(OR)				
7(a)	Differentiate between CSMA/CD and CSMA/CA. In which environments are they used and why?	5M	CO3	L2
(b)	Explain Standard Ethernet (10 Mbps) and Fast Ethernet (100 Mbps).	5M	CO3	L2
(OR)				
8(a)	Discuss about Link state routing protocol.	5M	CO3	L2
(b)	Describe operations of Address Resolution Protocol.	5M	CO3	L2
(OR)				
9.	Compare Virtual Circuit and Datagram networks with respect to setup time, reliability, and efficiency.	10M	CO3	L4
(OR)				
10(a)	Distinguish between connection less and connection services in Transport layer.	5M	CO3	L2
(b)	Analyze the differences between the Token Bucket and Leaky Bucket algorithms in terms of traffic shaping.	5M	CO3	L3
(OR)				
11(a)	Explain how DNS translates domain names into IP addresses. What is caching in DNS?	5M	CO3	L2
(b)	Describe the HTTP request-response cycle with an example of accessing a webpage.	5M	CO3	L2

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B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23EC09-DIGITAL COMMUNICATIONS**

(ECE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Draw Bi-polar RZ code for bit pattern 1011001.	2M	CO1	L2
(b)	Define analog and digital signal.	2M	CO1	L2
(c)	List the three basic steps involved in PCM.	2M	CO1	L2
(d)	Name different distortions in DM.	2M	CO1	L2
(e)	Write the equations for bit '1' and bit '0' in BFSK modulation.	2M	CO2	L2
(f)	Sketch PSK modulated signal for the message [1010].	2M	CO2	L2
(g)	Plot the error rate versus signal to noise ratio graph in M-ary FSK.	2M	CO3	L2
(h)	Write the expression for probability of error for coherent binary ASK receiver.	2M	CO3	L2
(i)	Define Hamming distance.	2M	CO4	L2
(j)	Formulate syndrome 'S' in linear block code.	2M	CO4	L2
(OR)				
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain various elements of a TDM System With block diagram.	5M	CO1	L2
(b)	Show that the linear quantization error is $\delta^2/12$.	5M	CO1	L2
(OR)				
3(a)	Represent data 10110100 using various line codes.	5M	CO1	L2
(b)	Explain different types of channels with characteristics.	5M	CO1	L2
4.	Elaborate with necessary block diagram to convert analog message signal into binary sequence using PCM system and reconstruct the same analog message signal at the receiver.	10M	CO2	L2
(OR)				
5(a)	With a neat sketch explain the principle and operation of Delta Modulation.	5M	CO1	L2
(b)	Compare PCM, DM and ADM techniques.	5M	CO1	L2
6(a)	Apply digital modulation scheme with block diagram, constellation diagram and waveforms to generate binary Amplitude shift keying (BASK).	5M	CO2	L3
(b)	Compare the ASK, FSK and PSK modulation schemes.	5M	CO2	L2
(OR)				
7(a)	Illustrate the generation of Quadrature Amplitude Modulation (QAM) signal.	5M	CO2	L2
(b)	Draw the constellation diagrams of phase shift keying (PSK) and Quadrature Phase shift keying (QPSK) modulated signal.	5M	CO2	L2
8(a)	Derive the expression for probability of error for non-coherent FSK and DPSK.	5M	CO3	L3
(b)	Illustrate the block diagram of Matched filter receiver.	5M	CO3	L3
(OR)				
9.	Apply the concept of Euclidean distance in noisy environment to derive the expression for probability of error for coherent binary PSK receiver.	10M	CO3	L3
10(a)	Interpret the procedure to generate linear block codes using generator matrix and to check the error at the receiver.	5M	CO4	L3
(b)	An error control code (7,4) has the following generator matrix $G = \begin{bmatrix} 1 & 0 & 0 & 0 & & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & & 1 & 0 & 1 \end{bmatrix}$ (i) Find the code words for the message [1 01 0] (ii) Find the syndrome for error code word at the receiver.	5M	CO4	L3
(OR)				
11(a)	Obtain code words for (7,4) cyclic code with generator polynomial, $g(x)=1+x+x^3$ in systematic form for a given messages [1001] and [1101].	5M	CO4	L3
(b)	Illustrate the decoding process of Convolutional codes using Trellis diagram with an example.	5M	CO4	L3

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

23EE11-DIGITAL CIRCUITS

(EEE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Write any two Boolean Laws to minimize the functions.	2M	CO1	L1
(b)	What is the importance of Don't care condition in K-map?	2M	CO1	L2
(c)	Write truth table of 4 to 2 priority encoder.	2M	CO1	L2
(d)	What is Programmable Array Logic?	2M	CO1	L2
(e)	What is main difference between Truth table and Excitation table of Flip Flops?	2M	CO2	L2
(f)	How many flip flops required to design a MOD-7 counter & What are states to count?	2M	CO2	L2
(g)	Briefly explain about state diagram.	2M	CO3	L2
(h)	What is next state of T flip flop by using characteristics equation?	2M	CO3	L2
(i)	What are logic levels used in Logic families?	2M	CO4	L2
(j)	What are examples of Digital ICs?	2M	CO4	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Apply K-map grouping to find out maxterms for the following function $F(A,B,C,D)=\prod M(0,2,3,8,9,12,13,15)$	5M	CO1	L3
(b)	"NAND & NOR Gates are called Universal Gates" Justify statement.	5M	CO1	L3
(OR)				
3(a)	Implement a 4-bit binary adder by cascading four full adders and derive its block diagram.	5M	CO1	L3
(b)	Using Quine-McCluskey technique minimize the following Boolean function $f(A,B,C,D)=\sum m(0,1,5,7,10,14)$.	5M	CO1	L3
(OR)				
4(a)	How do you re-assign the following function with one 4 to 1 multiplexer. $F(A,B,C)=\sum m(0,1,4,5,6,7)$.	5M	CO1	L3
(b)	Realize 4-to-16 line decoder using two 3-to-8 decoders.	5M	CO1	L3
(OR)				
5(a)	Apply PROM programming to implement two functions simultaneously: $F1(A,B,C)=\sum m(0,1,4,7)$, $F2(A,B,C)=\sum m(2,3,5,6)$.	5M	CO1	L3
(b)	Design a PLA with minimum number of product terms required for: $F1(A,B,C)=\sum m(0,1,3,5)$ $F2(A,B,C)=\sum m(3,5,7)$	5M	CO1	L3
(OR)				
6(a)	How do you convert JK flip flop to SR Flip flop? Demonstrate the process step by step.	5M	CO2	L3
(b)	Derive characteristic equations for the following Flip Flops, (i) SR flip-flop (ii) T flip-flop.	5M	CO2	L2
(OR)				
7(a)	Design a 3-bit asynchronous (ripple) counter using JK flip-flops and draw its state diagram.	5M	CO2	L3
(b)	Apply the concept of shift registers to design a 4-bit bi-directional shift register.	5M	CO2	L3

23EE11-DIGITAL CIRCUITS

8(a)	Using any state diagram as your own, demonstrate how a Mealy machine works & how it different with Moore machine.	5M	CO3	L3																																		
(b)	Reduce the state table and draw the reduced state diagram for the following State table. Comment on type of machine given whether Melay or Moore.	5M	CO3	L3																																		
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Present state</th><th colspan="2">Next state</th><th colspan="2">Output</th></tr> <tr> <th>X = 0</th><th>X = 1</th><th>X = 0</th><th>X = 1</th></tr> </thead> <tbody> <tr> <td>a</td><td>b</td><td>c</td><td>0</td><td>0</td></tr> <tr> <td>b</td><td>d</td><td>e</td><td>1</td><td>0</td></tr> <tr> <td>c</td><td>c</td><td>d</td><td>0</td><td>1</td></tr> <tr> <td>d</td><td>a</td><td>d</td><td>0</td><td>0</td></tr> <tr> <td>e</td><td>c</td><td>d</td><td>0</td><td>1</td></tr> </tbody> </table>					Present state	Next state		Output		X = 0	X = 1	X = 0	X = 1	a	b	c	0	0	b	d	e	1	0	c	c	d	0	1	d	a	d	0	0	e	c	d	0	1
Present state	Next state		Output																																			
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a	b	c	0	0																																		
b	d	e	1	0																																		
c	c	d	0	1																																		
d	a	d	0	0																																		
e	c	d	0	1																																		
(OR)																																						
9(a)	Construct the state table and state diagram of D flip-flops.	5M	CO3	L3																																		
(b)	Draw the State diagram to detect the sequence 1010 using Melay Model (overlapping will be accepted).	5M	CO3	L3																																		
10(a)	How do you classify the logic families? Discuss any one unipolar logic family with neat diagram.	5M	CO4	L2																																		
(b)	With circuit schematic, explain the operation of two input TTL NAND gate.	5M	CO4	L2																																		
(OR)																																						
11(a)	Why CMOS logic is preferred for VLSI design compared to TTL?	5M	CO4	L2																																		
(b)	Describe the working operation of 2-input DTL NAND gate with neat diagram.	5M	CO4	L2																																		

04 JUN 2026

H.T.No

R23

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

B.Tech. (V Semester) Supplementary Examinations

23ME11-THERMAL ENGINEERING

(ME)

Time : 3 hours

Max. Marks: 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	What is knocking in CI engine and what causes it?	2M	CO1	L1
(b)	Define Volumetric efficiency in IC engines.	2M	CO1	L1
(c)	What is the purpose of the condenser in a Rankine cycle?	2M	CO2	L1
(d)	Differentiate between fire tube and water tube boilers.	2M	CO2	L1
(e)	When do you use convergent - divergent nozzle?	2M	CO3	L1
(f)	Why is it called as high level jet condenser in condensing plants?	2M	CO3	L1
(g)	Find the maximum efficiency of impulse steam turbine, when the nozzle angle is 20° .	2M	CO4	L1
(h)	Classify the jet propulsion units.	2M	CO4	L1
(i)	Write the equation for work developed in compressor considering the clearance volume.	2M	CO5	L1
(j)	Mention two points on how the volumetric efficiency is lowered in compressors.	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Compare the two stroke and four stroke IC engines.	5M	CO1	L2
(b)	A four-cylinder engine running at 1200 rpm delivers 20 kW. The average torque when one cylinder was cut is 110 Nm. Find the indicated thermal efficiency, if the calorific value of the fuel is 43 MJ/kg and the engine uses 360 grams of gasoline per kWh.	5M	CO1	L3
(OR)				
3(a)	Summarize the stages of combustion in SI engine with necessary diagram.	5M	CO1	L2
(b)	The following details were noted in a test on a four-cylinder, four-stroke engine, diameter=100 mm; stroke=120 mm; speed of the engine = 1600 rpm; fuel consumption = 0.2 kg/min; Calorific value of fuel is 44000 kJ/kg; difference in tension on either side of the brake pulley = 40 kg; brake circumference is 300 cm. If the mechanical efficiency is 80%, Calculate (i) brake thermal efficiency (ii) indicated thermal efficiency.	5M	CO1	L3
4(a)	Derive the expression for efficiency of a Rankine cycle with and without reheating.	5M	CO2	L3
(b)	Explain the construction and working of Babcock and Wilcox Boiler.	5M	CO2	L2
(OR)				
5(a)	What is draught? Differentiate between Induced and forced draught systems.	5M	CO2	L2
(b)	A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 150 bar, 550°C expands through high pressure turbine. It is reheated at a constant pressure of 40 bar to 550°C and expands through the low-pressure turbine to a condenser pressure at 0.1 bar. Draw the T-S diagram. Find the (i) Quality of steam turbine exhaust (ii) Cycle efficiency.	5M	CO2	L3
6(a)	Obtain the expression for the critical pressure ratio through nozzle under maximum discharge flow condition for steam initially saturated.	5M	CO3	L3
(b)	Dry saturated steam enters a steam nozzle at a pressure of 12 bar and is discharged at a pressure of 1.5 bar and dryness fraction 0.95. What will be the final velocity of steam? Neglect initial velocity. If 12 % heat drop is lost in friction, find the percentage reduction in final velocity.	5M	CO3	L3
(OR)				
7(a)	Compare the jet and surface condensers.	5M	CO3	L2
(b)	From the following data, Determine the vacuum efficiency. Vacuum reading at steam inlet to the condenser = 710 mm of Hg, Barometer reading = 760 mm of Hg, Hot well temperature = 35°C .	5M	CO3	L3
8(a)	State the necessity of compounding in steam turbines and explain the pressure compounding method with a neat sketch.	5M	CO4	L2
(b)	Obtain the expression for Degree of reaction (DOR) for Parson's reaction turbine.	5M	CO4	L3
(OR)				
9(a)	Describe the working of closed cycle gas turbine with neat sketch.	5M	CO4	L2
(b)	The simple gas turbine plant operates on Joule cycle and has a pressure ratio of 6 and the maximum and minimum temperature of the cycle are 1000 K and 288 K respectively. Assuming an ideal cycle, calculate the efficiency and specific work output of the plant.	5M	CO4	L3
10.	What is meant by multistage compression? Obtain the expressions for work done in two stage compressors without and with perfect intercooling.	10M	CO5	L3
(OR)				
11(a)	Differentiate between surging and stalling. What are its effects on compressors?	5M	CO5	L2
(b)	Distinguish between the centrifugal and axial compressors.	5M	CO5	L2

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

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

R23
5/6/26**23AD05-DATA VISUALIZATION**

(AI&DS)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define data visualization and why it is important for.	2M	CO1	L1
(b)	Differentiate between computer graphics and data visualization.	2M	CO1	L2
(c)	List the main components of the visualization reference model.	2M	CO2	L1
(d)	What is visual mapping in the context of data visualization?	2M	CO2	L2
(e)	List the basic techniques for visualizing one-dimensional data.	2M	CO3	L1
(f)	What is multi-dimensional data?	2M	CO3	L1
(g)	What is cone tree visualization?	2M	CO4	L1
(h)	Give one advantage of network visualization.	2M	CO4	L1
(i)	Define benchmarking in visualization evaluation.	2M	CO5	L1
(j)	What is vector field visualization?	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Describe visualization techniques used for nominal, ordinal, interval, and ratio data.	5M	CO1	L2
(b)	"Visualization is both a science and an art." Justify this statement with suitable examples?	5M	CO1	L3
(OR)				
3(a)	Discuss different ways to deal with missing data in a dataset and mention the pros and cons of each method.	5M	CO1	L2
(b)	Discuss in detail how Gestalt principles can be applied to design an effective dashboard.	5M	CO1	L2
4(a)	Discuss different types of mappings that can be applied on the given data for proper visual representation.	5M	CO2	L2
(b)	Describe how the visualization reference model guides the development of interactive dashboards.	5M	CO2	L2
(OR)				
5(a)	Discuss the role of visual analytics in decision-making with an example.	5M	CO2	L2
(b)	Describe the key principles to follow while designing a visualization application.	5M	CO2	L2
6(a)	Illustrate visualization techniques for multi-dimensional data.	5M	CO3	L2
(b)	Discuss evaluation criteria for visualization systems and methods to assess effectiveness.	5M	CO3	L2
(OR)				
7(a)	Describe text visualization techniques and their applications in analyzing documents.	5M	CO3	L2
(b)	Discuss the design principles for building an interactive visualization system.	5M	CO3	L2
8(a)	Illustrate visualization techniques for graphs and networks with real-world applications.	5M	CO4	L2
(b)	Discuss how metaphorical visualization can improve understanding of complex data.	5M	CO4	L2
(OR)				
9(a)	Describe cluster visualization and its applications.	5M	CO4	L2
(b)	Compare and contrast different approaches to visualizing hierarchical data.	5M	CO4	L2
10(a)	Compare static maps and GIS-based interactive maps.	5M	CO5	L2
(b)	Discuss recent trends in visualization techniques and perception methods for complex datasets.	5M	CO5	L2
(OR)				
11(a)	Describe different types of simulation visualizations and their applications.	5M	CO5	L2
(b)	Discuss various techniques for visualizing volumetric data with examples.	5M	CO5	L2

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23CE10-GEOTECHNICAL ENGINEERING-I**

(CE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Determine the porosity of the soil if the void ratio of the soil is given by 1.	2M	CO1	L3
(b)	Define the terms "plasticity Index" and "Thixotropy".	2M	CO1	L1
(c)	Express the formula for determination of coefficient of permeability of fine-grained soil in the laboratory.	2M	CO2	L2
(d)	List out the factors affecting the permeability of soil.	2M	CO2	L1
(e)	Explain the seepage pressure through the soil mass.	2M	CO2	L2
(f)	State the assumptions made in Boussinesq theory.	2M	CO3	L2
(g)	Mention the laboratory tests were conducted on soil sample to determine the MDD and OMC.	2M	CO4	L2
(h)	Explain the term "Coefficient of volume compressibility".	2M	CO4	L2
(i)	List out the advantages of unconfined compression test.	2M	CO5	L1
(j)	Express the formula for determination of undrained shear strength of soil by using laboratory vane shear test.	2M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain the terms with the help of three-phase diagram degree of saturation, water content and bulk unit weight.	5M	CO1	L2
(b)	A specimen of soil having a volume of 300 CC weighs 550 gm in wet condition. Determine voids ratio, degree of saturation, porosity and water content of the soil specimen if after oven drying at 105°C for 24 hours, its weight reduced to 472 gm. Take $G = 2.67$.	5M	CO1	L3
(OR)				
3(a)	Define consistency of soils. Draw a neat sketch to show change in the volume of soil due to change in the water content for a cohesive soil and define Atterberg limits.	5M	CO1	L2
(b)	Explain the terms "flow index, activity and sensitivity" of soil.	5M	CO1	L2
4(a)	Describe constant head permeability test for determination of coefficient of permeability.	5M	CO2	L2
(b)	Calculate the coefficient of permeability of a soil sample, 6cm in height and 50cm ² in a cross-sectional area, if a quantity of water equal to 450ml passed down in 10minutes under an effective constant head of 40cm.	5M	CO2	L3
(OR)				
5.	A sand deposit is 10 m thick and overlies a bed of soft clay. The ground water table is 3 m below the ground surface. If the sand above the ground water table has a degree of saturation of 45%, plot the diagram showing the variation of the total stress, pore water pressure and the effective stress. The void ratio of the sand is 0.70. Take $G = 2.65$.	10M	CO2	L3
6(a)	Illustrate "quick sand condition" and derive expression for critical hydraulic gradient.	5M	CO2	L2

23CE10-GEOTECHNICAL ENGINEERING-I

(b)	The porosity of a sample of sand in the loose state was 54% & dense 38%. Find critical hydraulic gradient at both cases. Assume $G=2.60$. Find saturated densities.	5M	CO2	L3																								
(OR)																												
7(a)	With a neat sketch, explain the use of Newmark's influence chart to find stress at a given point under a loaded area.	5M	CO3	L2																								
(b)	A water tank is constructed by a ring foundation having outer diameter of 8 m and inner diameter of 6 m. The uniform load intensity on foundation is 200kN/m^2 . Determine the vertical stress caused by the water tank at a depth of 4 m below the centre of the foundation.	5M	CO3	L3																								
(OR)																												
8(a)	Differentiate between consolidation and compaction. Give examples.	5M	CO4	L2																								
(b)	In a standard proctor test the following observations were recorded: <table><tr><td>Sample No.</td><td>Bulk density</td><td>Water content</td></tr><tr><td></td><td>(kg/m^3)</td><td>(%)</td></tr><tr><td>01</td><td>197</td><td>11.3</td></tr><tr><td>02</td><td>2083</td><td>12.2</td></tr><tr><td>03</td><td>2147</td><td>13.0</td></tr><tr><td>04</td><td>2208</td><td>14.2</td></tr><tr><td>05</td><td>2188</td><td>15.1</td></tr><tr><td>06</td><td>2147</td><td>16.4</td></tr></table> Plot the moisture density curve and find MDD and OMC.	Sample No.	Bulk density	Water content		(kg/m^3)	(%)	01	197	11.3	02	2083	12.2	03	2147	13.0	04	2208	14.2	05	2188	15.1	06	2147	16.4	5M	CO4	L3
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06	2147	16.4																										
(OR)																												
9.	A saturated soil stratum 4m thick lies above an impervious stratum and below a previous stratum. It has void ratio of 1.50 at an initial pressure of 150kN/m^2. (i) Compute the change in void ratio due to an increase of stress of 50kN/m^2. Take $C_c=0.20$ (ii) Also compute the final settlement of the soil stratum due to above increase in stress. (iii) What would be the time required for 50% consolidation? Take $T_v=0.20$ and $k=3.0 \times 10^{-4}\text{cm/sec}$.	10M	CO4	L3																								
(OR)																												
10(a)	Explain the different drainage conditions in Direct Shear Test.	5M	CO5	L2																								
(b)	State the classification of soils according to cohesion.	5M	CO5	L2																								
(OR)																												
11.	The following results were obtained from a CU test on a normally consolidated clay. Plot the strength envelope in terms of total stresses and effective stresses and determine the shear strength parameters. <table><tr><td>S.NO</td><td>Cell pressure</td><td>Deviator stress</td><td>Pore water pressure</td></tr><tr><td></td><td>(kN/m^2)</td><td>(kN/m^2)</td><td>(kN/m^2)</td></tr><tr><td>1.</td><td>250</td><td>152</td><td>120</td></tr><tr><td>2.</td><td>500</td><td>300</td><td>250</td></tr><tr><td>3.</td><td>750</td><td>455</td><td>350</td></tr></table>	S.NO	Cell pressure	Deviator stress	Pore water pressure		(kN/m^2)	(kN/m^2)	(kN/m^2)	1.	250	152	120	2.	500	300	250	3.	750	455	350	10M	CO5	L3				
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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

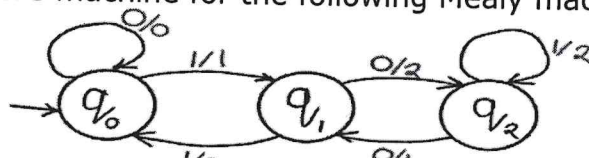
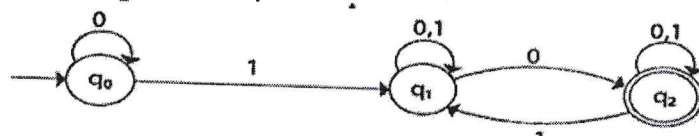
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B.Tech. (V Semester) Regular/Supplementary Examinations

23CS08-FORMAL LANGUAGES AND AUTOMATA THEORY
(CSE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Construct a DFA for strings over $\{a, b\}$ that contain at least two consecutive a's.	2M	CO1	L3
(b)	Design a Moore machine that outputs 1 for every input "a".	2M	CO1	L3
(c)	Construct the Regular Expression for the language containing all strings having any number of a's and b's, except the null string.	2M	CO2	L3
(d)	Construct NFA with ϵ moves for the regular expression $(01+10)$.	2M	CO2	L3
(e)	Consider the Grammar $S \rightarrow AA, A \rightarrow AAA a bA Ab$ show that this is an Ambiguous Grammar	2M	CO3	L3
(f)	Eliminate the Null productions from Following Grammar $S \rightarrow XYX, X \rightarrow 0X \epsilon, Y \rightarrow 1Y \epsilon$	2M	CO3	L3
(g)	Does push down automata have memory? Give explanation.	2M	CO4	L2
(h)	Draw the graphical notation of a PDA for the language of balanced parentheses.	2M	CO4	L3
(i)	Construct a transition diagram for a TM that increments a unary number by 1.	2M	CO5	L3
(j)	Define an Instantaneous Description (ID) of a Turing Machine with an example.	2M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Construct Moore machine for the following Mealy machine. 	5M	CO1	L3
(b)	Construct DFA for the following Languages over an alphabet $\{0,1\}$ (i) Contains a substring "001" (ii) Accepting odd number of 0's and odd number of 1's.	5M	CO1	L3
(OR)				
3(a)	Convert given NFA into Equivalent DFA 	5M	CO1	L3
(b)	Design a Moore Machine that finds the 2's complement of any given binary number.	5M	CO1	L3
4(a)	Construct NFA with ϵ -Moves for the regular expression $10+(0+11)0^*1$.	5M	CO2	L3
(b)	Convert given right linear grammar to left linear grammar $S \rightarrow bB, B \rightarrow bC aB b, C \rightarrow a$	5M	CO2	L3
(OR)				
5(a)	Construct a Finite Automata recognizing $L(G)$ where G is the grammar $S \rightarrow aS/bA/b$ $A \rightarrow aA/bS/a$	5M	CO2	L3

23CS08-FORMAL LANGUAGES AND AUTOMATA THEORY

(b)	State Pumping Lemma for regular language. Prove that the Language $L = \{a^{2n} n \geq 1\}$ is not regular.	5M	CO2	L3
6.	Convert given Context Free Grammar into GNF $S \rightarrow XB \mid AA \quad A \rightarrow a \mid SA \quad B \rightarrow b \quad X \rightarrow a$	10M	CO3	L3
(OR)				
7(a)	Show that $L = \{a^n b^n c^n \mid n \geq 1\}$ is not a CFL	5M	CO3	L3
(b)	Simplify the given CFG $S \rightarrow ABaC$ $A \rightarrow BC$ $B \rightarrow b / \epsilon$ $C \rightarrow D / \epsilon$ $D \rightarrow d$	5M	CO3	L3
8(a)	Design PDA for $L = \{WCW^R \mid W \in (a+b)^*\}$ where R is the Reverse of the string and $W \in (a+b)^*$.	5M	CO4	L3
(b)	Construct PDA from the Given Context Free Grammar. $S \rightarrow aSb / aAB$ $S \rightarrow a / b / \epsilon$ $A \rightarrow c / d$ $B \rightarrow aA$	5M	CO4	L3
(OR)				
9.	Construct CFG for the given PDA $\delta(q_0, a, Z) = \{(q_0, XZ)\}$ $\delta(q_0, \epsilon, Z) = \{(q_1, X)\}$ $\delta(q_1, a, X) = \{(q_1, \epsilon)\}$ $\delta(q_1, b, X) = \{(q_1, XX)\}$ $\delta(q_1, a, Z) = \{(q_1, Z)\}$	10M	CO4	L3
10(a)	Explain how the PCP relates to Turing machines and the halting problem.	5M	CO5	L2
(b)	Model a Turing Machine that checks whether a given number is prime or not.	5M	CO5	L3
(OR)				
11.	Design a Turing Machine to accept the language $L = \{wcw^R \mid w \in (a+b)^*\}$.	10M	CO5	L3

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

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

23CS06-OPERATING SYSTEMS

(CSE(AI&ML))

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL												
1(a)	Discuss the operating system operations.	2M	CO1	L2												
(b)	Difference between Monolithic kernel and Micro kernel.	2M	CO1	L2												
(c)	Define thread cancellation and target thread.	2M	CO2	L1												
(d)	Distinguish between CPU bounded and I/O bounded processes.	2M	CO2	L2												
(e)	What is resource allocation graph in deadlock with the help of example.	2M	CO3	L1												
(f)	List the conditions to be satisfied to ensure solution to critical section problem.	2M	CO3	L2												
(g)	Define page fault, and how is it handled.	2M	CO4	L2												
(h)	Differentiate external fragmentation with internal fragmentation.	2M	CO4	L2												
(i)	Define UFD and MFD.	2M	CO5	L1												
(j)	List the operations that can be performed on the directory.	2M	CO5	L2												
Q.No	All questions carry equal marks	Marks	CO	BL												
2(a)	Define operating system. Write the goals of OS.	5M	CO1	L2												
(b)	Describe in detail about Free and Open-Source Operating Systems.	5M	CO1	L2												
(OR)																
3(a)	Define a System call. Explain the various types of system calls provided by Operating System.	5M	CO1	L2												
(b)	List and Describe the different operating system Services.	5M	CO1	L2												
4.	Find and explain the average waiting time and turnaround time for the following processes using FCFS, SJF, Priority and Round Robin scheduling algorithms. <table border="1"><thead><tr><th>Process</th><th>Burst Time</th></tr></thead><tbody><tr><td>P1</td><td>29</td></tr><tr><td>P2</td><td>10</td></tr><tr><td>P3</td><td>7</td></tr><tr><td>P4</td><td>12</td></tr><tr><td>P5</td><td>3</td></tr></tbody></table> Quantum Time is: 10ms	Process	Burst Time	P1	29	P2	10	P3	7	P4	12	P5	3	10M	CO2	L3
Process	Burst Time															
P1	29															
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P3	7															
P4	12															
P5	3															
(OR)																
5(a)	What are the advantages of Inter-process communication? How communication takes place in a shared-memory environment? Explain.	5M	CO2	L2												
(b)	Describe Multithreading Models with neat diagrams.	5M	CO2	L2												
6(a)	Describe the Dining Philosopher problem. Develop an algorithm to solve this problem using semaphore.	5M	CO3	L2												
(b)	Summarized Readers and writers Problem with an example.	5M	CO3	L2												
(OR)																
7(a)	Illustrate Critical Section Problem and Peterson's Solution for solving it.	5M	CO3	L2												
(b)	Analyze deadlock detection using an algorithm and methods to prevent deadlocks.	5M	CO3	L3												
8(a)	Write a short note on Hardware support on Paging Concept with neat diagram.	5M	CO4	L2												
(b)	Compare external fragmentation with internal fragmentation. Describe the solution to external fragmentation.	5M	CO4	L2												
(OR)																
9.	Describe the following allocation algorithms: Best-fit, first-fit and worst-fit. Given memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB, how would each of the above algorithms place processes of 212 KB, 417 KB, 112 KB and 426 KB? Which algorithm makes efficient use of memory?	10M	CO4	L3												
10(a)	Describe the implementation of directory using Linear List and Hash table.	5M	CO5	L2												
(b)	Illustrate various file allocation techniques in detail with their relative advantages and disadvantages.	5M	CO5	L2												
(OR)																
11(a)	Describe sequential access and direct access methods.	5M	CO5	L2												
(b)	How protection is implemented using access matrix?	5M	CO5	L2												

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

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

23EC10-ANTENNAS AND WAVE PROPAGATION

(ECE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Discuss Various Lobes present in Radiation Pattern.	2M	CO1	L1
(b)	Define Resolution related to Antennas.	2M	CO1	L1
(c)	Find the distance at which induction and radiation fields are equal.	2M	CO2	L1
(d)	List various types of Loop Antenna with neat sketch.	2M	CO2	L1
(e)	What is the use of antenna array?	2M	CO3	L1
(f)	List the properties of broad side arrays.	2M	CO3	L1
(g)	Define F/D ratio of a parabolic reflector.	2M	CO2	L1
(h)	Mention applications of microstrip antenna.	2M	CO2	L1
(i)	What is the possible range of heights for the occurrence of Ionospheric region D, E, F1 and F2 Layers?	2M	CO4	L1
(j)	In which frequency range space wave propagation is useful.	2M	CO4	L1
(OR)				
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Discuss the following antenna parameters (i) Radiation intensity (ii) Antenna efficiency (iii) Power gain (iv) Front to back ratio.	5M	CO1	L2
(b)	Derive the relationship between Directivity and Power gain.	5M	CO1	L2
(OR)				
3(a)	Explain the current distribution on a thin-wire antenna with various lengths.	5M	CO1	L2
(b)	Derive the relationship between Effective length, Aperture Area and Radiation resistance.	5M	CO1	L2
(OR)				
4.	Derive the radiation resistance of alternating current element (Hertzian dipole).	10M	CO1	L2
(OR)				
5(a)	Show that directivity of Half wave dipole antenna is 1.64.	5M	CO2	L3
(b)	Derive the radiated fields by small loop antenna.	5M	CO2	L2
(OR)				
6(a)	Prove that impedance of two wire folded dipole antenna is 292Ω .	5M	CO2	L3
(b)	Illustrate the array of 4 point sources using method of pattern multiplication.	5M	CO3	L3
(OR)				
7(a)	Demonstrate the characteristics of Yagi-Uda antenna with neat sketch.	5M	CO2	L3
(b)	Derive the expression for electric field of N element uniform array.	5M	CO3	L3
(OR)				
8(a)	Interpret Log periodic antenna regions based on lengths of dipoles with neat sketch.	5M	CO2	L2
(b)	Analyze various feeding techniques of Parabolic Antenna.	5M	CO2	L2
(OR)				
9(a)	Discuss the working principle of Helical antenna in various modes.	5M	CO2	L2
(b)	Interpret radiation mechanism of microstrip patch antennas.	5M	CO2	L2
(OR)				
10(a)	Examine the experimental setup for radiation pattern measurement of an antenna along with necessary precautions.	5M	CO4	L3
(b)	Calculate the critical frequency of EM wave for E ($N = 4 \times 10^5$ electron/cm ³) layer, F1 ($N = 4 \times 10^6$ electron/cm ³) Layer.	5M	CO4	L3
(OR)				
11(a)	Determine the procedure for determining antenna gain by the three-antenna method based on the Friis equation.	5M	CO4	L3
(b)	Derive the expression for field strength of Tropospheric wave propagation.	5M	CO4	L2

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

23EE12-POWER SYSTEMS-II

(EEE)

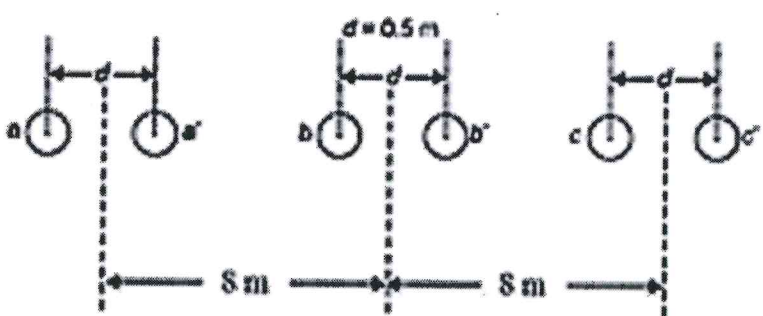
Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Mention the effect of ground on line capacitance.	2M	CO1	L2
(b)	List the parameters of transmission line.	2M	CO1	L1
(c)	Classify the transmission lines based on the operating voltages.	2M	CO2	L2
(d)	What is attenuation constant?	2M	CO2	L1
(e)	Represent the travelling voltage wave in the transmission line.	2M	CO3	L1
(f)	Mention reflection coefficient if a transmission line is terminated by a resistance, for transient/switching surge on line.	2M	CO3	L2
(g)	Mention the power loss expression due to corona phenomenon.	2M	CO4	L1
(h)	List out the methods to reduce the Corona effect.	2M	CO4	L2
(i)	State the effect of wind on Sag calculations.	2M	CO5	L2
(j)	List out the methods to improve the string efficiency, of string Insulators.	2M	CO5	L2

Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Compare various types of conductors used in the transmission lines.	5M	CO1	L2
(b)	Derive the expression for capacitance of single-phase circuit line.	5M	CO1	L2

(OR)

3(a)	Derive the expression for the inductance of three phase transposed conductor line with symmetrical spacing.	5M	CO1	L3
(b)	A bundled conductor has two sub-conductors which are configured for a three-phase line as shown in the below figure. Compute inductive reactance per phase of this line at 50 Hz. Assume that radius of each sub-conductor is 30 mm and line is fully transposed. 	5M	CO1	L3

4.	Derive equivalent parameters of two transmission lines when they are connected in (a) tandem and (b) parallel.	10M	CO2	L3
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(OR)

5(a)	Derive the expression for the percentage voltage regulation of a short transmission line by using phasor diagram.	5M	CO2	L3
(b)	A 15km long 3-phase overhead line delivers 5MW at 11kV at a power factor of 0.8 lagging. Line loss is 12% of the power delivered. Line inductance is 1.1mH/km per phase. Calculate (i) sending end voltage and regulation (ii) power factor of the load to make regulation zero.	5M	CO2	L3

23EE12-POWER SYSTEMS-II

6(a)	Deduce the variation of current and voltage on an overhead line when one end of the line is (i) short-circuited, and (ii) open-circuited and at the other end a source of constant e.m.f. V is switched in.	5M	CO3	L3
(b)	Two stations are connected together by an underground cable having a surge impedance of 60 ohms joined to an overhead line with a surge impedance of 400 ohms. If a surge having a maximum value of 100 kV travels along the cable towards the junction with the overhead line, determine the value of the reflected and transmitted wave of voltage and current at the junction.	5M	CO3	L3
(OR)				
7(a)	Derive the reflection and refraction coefficients found at a T-junction.	5M	CO3	L3
(b)	A surge of 100 kV travelling in a line of natural impedance 600ohms arrives at a junction with two lines of impedances 800 ohms and 200 ohms respectively. Find the surge voltages and currents transmitted into each branch line.	5M	CO3	L3
8(a)	Define (i) disruptive critical voltage (ii) visual critical voltage. Discuss the factors on which they depend.	5M	CO4	L2
(b)	Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 110 kV which has conductor of 1.25 cm dia arranged in a 3.05 metre delta. Assume air density factor of 1.07 and the dielectric strength of air to be 21 kV/cm.	5M	CO4	L3
(OR)				
9(a)	What is corona loss? How it can be estimated?	5M	CO4	L2
(b)	Discuss on radio interference due to corona.	5M	CO4	L2
10(a)	Describe the pin type insulator with neat diagram and discuss its advantages, disadvantages.	5M	CO5	L2
(b)	A string of suspension insulator consists of 5 units. The voltage between each pin and earth is one tenth of the self-capacitance of the unit. The voltage between the line conductor and earth is 220kV. Determine: (i) the voltage distribution across each unit and (ii) the string efficiency.	5M	CO5	L3
(OR)				
11(a)	Deduce expressions for calculating sag and conductor length of an Over Head line when the supports are at the same level.	5M	CO5	L3
(b)	An overhead line has the following data: Span length 160 metres, conductor dia 0.95 cm, weight per unit length of the conductor 0.65 kg/metre. Ultimate stress 4250 kg/cm ² , wind pressure 40 kg/m ² of projected area. Factor of safety 5.	5M	CO5	L3

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

23CS12-AUTOMATA THEORY & COMPILER DESIGN

(IT)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Describe the language of automata with an example and how an automaton can recognize it.	2M	CO1	L2
(b)	Describe Extended transition function of NFA.	2M	CO1	L2
(c)	Explain Regular Expression and its components.	2M	CO2	L3
(d)	Given the CFG $S \rightarrow aSb \mid \epsilon$, demonstrate the sequence of sentential forms in the leftmost derivation of the string aab.	2M	CO2	L3
(e)	Differentiate between acceptance by <i>final state</i> and <i>empty stack</i> in a PDA.	2M	CO3	L3
(f)	Differentiate between Deterministic and Non-Deterministic Turing Machines.	2M	CO3	L3
(g)	Describe the primary role of a lexical analyzer in a compiler.	2M	CO4	L2
(h)	Explain Left recursion how to eliminate it.	2M	CO4	L2
(i)	Differentiate between synthesized and inherited attributes.	2M	CO5	L3
(j)	What is a run-time environment?	2M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Draw a DFA for the language accepting strings containing neither '00', nor '11' as substring over input alphabets $\Sigma = \{0, 1\}$.	5M	CO1	L3
(b)	Design NFA with $\Sigma = \{0, 1\}$ and accept all strings of length atleast 2.	5M	CO1	L3
(OR)				
3(a)	Describe Conversion of NFA to DFA with example.	5M	CO1	L2
(b)	Explain ϵ -closure with example.	5M	CO1	L2
4(a)	Construct RE for the following statements (i) set of all words starting with a and ending with b (ii) Set of all words with exactly two b's (iii) set of all words with no two consecutive a's over $\{a,b\}$ (iv) all strings that do not end with ab, over $\Sigma = \{a,b\}$.	5M	CO2	L3
(b)	Describe the basic operations of Regular expressions with example.	5M	CO2	L2
(OR)				
5(a)	Construct the regular expression for the following DFA 	5M	CO2	L3
(b)	For given grammar $S \rightarrow (L)a$, $L \rightarrow L,S \mid S$. Derive LMD & RMD and Draw parse tree for the string $w = (a, ((a,a), (a,a)))$	5M	CO2	L3
6.	Discuss the equivalence between PDA and CFG with example.	10M	CO3	L3
(OR)				
7(a)	Explain the formal definition and working of a Turing Machine.	5M	CO3	L2
(b)	Explain Undecidable Problems about Turing Machines.	5M	CO3	L2
8(a)	Illustrate the following statement on all phases of the compiler position: $= \text{initial} + \text{rate} * 60$	5M	CO4	L3
(b)	Discuss input buffering in lexical analysis. Explain the advantages of using a two-buffer scheme over a single buffer with an example of a source program.	5M	CO4	L2
(OR)				
9.	Calculate First and Follow and parsing table for the given grammar and check the given string is parse successfully ($w = id + id * id$). $E \rightarrow TE'$, $E' \rightarrow +TE' \mid \epsilon$, $T \rightarrow FT'$, $T' \rightarrow *FT' \mid \epsilon$, $F \rightarrow (E) \mid id$	10M	CO4	L3
10(a)	Define variants of syntax tree and its construction for the expression $x*y-5+z$	5M	CO5	L3
(b)	Design the dependency graph with example.	5M	CO5	L3
(OR)				
11(a)	How to Access the non-local data on the stack?	5M	CO5	L2
(b)	Define Activation record briefly.	5M	CO5	L2

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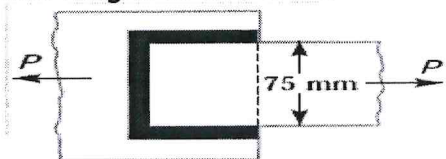
B.Tech. (V Semester) Regular/Supplementary Examinations

23ME12-DESIGN OF MACHINE ELEMENTS

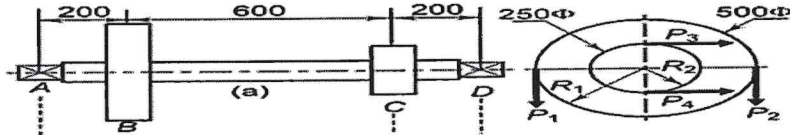
(ME)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define factor of safety and write its significance.	2 M	CO1	L1
(b)	Define Endurance limit.	2 M	CO1	L1
(c)	Define an eccentrically loaded welded joint.	2 M	CO2	L1
(d)	Define the gasketed welded joint.	2 M	CO2	L1
(e)	Write the equation for equivalent bending moment.	2 M	CO3	L1
(f)	Define the coupling and mention its purpose of use.	2 M	CO3	L1
(g)	Write the Lewis equation and mention its significance.	2 M	CO4	L1
(h)	Provide the applications of helical compression springs.	2 M	CO4	L1
(i)	Distinguish between full and partial bearings.	2 M	CO5	L1
(j)	Define static load & dynamic load carrying capacities.	2 M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Discuss the basic procedure of machine design.	5 M	CO1	L2
(b)	The shaft is subjected to a bending moment of 4000 N-m and turning moment of 3000 N-m. Determine the diameter of shaft using the maximum shear stress theory of failure. Take yield strength in tension is 400MPa and factor of safety is 2.5.	5 M	CO1	L3
(OR)				
3(a)	Discuss various methods to reduce stress concentration of a machine element.	5M	CO1	L2
(b)	A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 250 kN to a maximum of 450kN. It is manufactured of a material with an ultimate tensile strength of 980 MPa and an endurance limit of 500 MPa. Determine the diameter of bar using safety factors of 3 and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design.	5 M	CO1	L3
4(a)	List out various advantages and limitations of welded joints.	5 M	CO2	L2
(b)	A plate 75 mm wide and 10 mm thick is joined with another plate by single transverse and double parallel fillet weld as shown in Fig. The joint is subjected to maximum tensile load of 60kN. The maximum tensile and shear stresses are 70 MPa and 50 MPa respectively. Find the length of the weld. 	5 M	CO2	L3
(OR)				
5(a)	Discuss various types of threads used in bolts.	5 M	CO2	L2
(b)	The head of an air compressor is attached by 8 bolts, the cylinder bore diameter is 80mm and working pressure is 3 Mpa. Determine the diameter of bolt. Take initial compressive load is 5000N, K=1, yield strength is 340N/mm ² and FS=3.	5 M	CO2	L3

23ME12-DESIGN OF MACHINE ELEMENTS

6.	The layout of a transmission shaft carrying two pulleys B and C and supported on bearings A and D is shown in fig. Power is supplied to the shaft by means of a vertical belt on the pulley B, which is then transmitted to the pulley C carrying a horizontal belt. The maximum tension in the belt on the pulley B is 2.5 kN. The angle of wrap for both the pulleys is 180° and the coefficient of friction is 0.24. The shaft is made of plain carbon steel 30C8 ($S_{yt}=400\text{N/mm}^2$) and the factor of safety is 3. Determine the shaft diameter on strength basis. 	10 M	CO3	L4
(OR)				
7(a)	Classify the types of keys with neat sketches.	5 M	CO3	L2
(b)	It is required to design a key for fixing a pulley on the shaft, which is 50 mm in diameter. The pulley transmits 10 kW power at 200rpm to the shaft. The key is made of steel 45C8 ($\sigma_{yt}=\sigma_{yc}=380\text{N/mm}^2$) and the factor of safety is 3. Determine the dimensions of the key. ($\sigma_{sy} = 0.5 S_{yt}$).	5 M	CO3	L3
8(a)	Classify the gears with neat sketches.	5 M	CO4	L2
(b)	A pair of 20° full depth involute profile spur gears are to transmit 24kW at a speed of 300 rpm of the pinion. The velocity ratio is 2:1. The pinion is made of cast steel having an allowable safe static stress $\sigma = 120\text{ MPa}$. While the gear is made of cast iron having allowable safe static stress $\sigma = 60\text{ MPa}$. The pinion has 18teeth and its face width is 10 times the module. Determine the module, face width and pitch diameters of both pinion and gear from standard point of strength. Check the design for beam strength and wear strength.	5 M	CO4	L3
(OR)				
9(a)	Explain the following terms related to springs. (i) spring index (ii) free length of spring	5 M	CO4	L2
(b)	A semi-elliptical spring has an overall length of 1.1 m and sustains a load of 70 kN at its centre. The spring has 3 extra full-length leaves and 13 graduated leaves with central band of 100 mm width. All the leaves are to be stressed equally without exceeding 420 N/mm^2 when fully loaded. The total depth of spring is twice the width. If E is $2.1 \times 10^5\text{N/mm}^2$ determine: Thickness and width of leaves. The load exerted on clipping bolts after spring is assembled.	5 M	CO4	L3
10.	Design a journal bearing for a centrifugal pump running at 1440rpm. The diameter of the journal is 100mm and the load on each bearing is 20kN. The factor ZN/P may be taken as 28 for centrifugal pump bearings. The bearing running at 75°C temperature and the atmospheric temperature is 30°C . the energy dissipation coefficient is $875\text{ W/m}^2/^\circ\text{C}$. Take diametral clearance as 0.1mm.	10 M	CO5	L3
(OR)				
11.	Select a suitable double row angular contact ball bearing for an axial flow compressor with a radial load of 2500 N & axial load of 1500N for a life of 1000 mr.	10 M	CO5	L3

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06 JUN 2026

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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING(AUTONOMOUS)

L.B.ReddyNagar: Mylavaram – 521 230:NTRDist.: A.P.

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

23ME81-SUSTAINABLE ENERGY TECHNOLOGIES

(AI&DS,CE,CSE and CSE(AI&ML))

Answer
6/6/26

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Differentiate renewable and non-renewable energy resources.	2M	CO1	L1
(b)	Define sustainable with examples.	2M	CO1	L1
(c)	Define packing density in PV modules.	2M	CO2	L1
(d)	State the purpose of mechanical insulation in PV modules.	2M	CO2	L1
(e)	Distinguish between flat and focusing collectors.	2M	CO3	L1
(f)	List the components of a flat plate collector.	2M	CO3	L1
(g)	Specify any two disadvantages of wind energy.	2M	CO4	L1
(h)	Define biomass.	2M	CO4	L1
(i)	Describe the role of a flash evaporator in a single-flash geothermal system.	2M	CO5	L1
(j)	List the advantage of alkaline fuel cells.	2M	CO5	L1
Q. No	All questions carry equal marks	Marks	CO	BL
2(a)	Discuss the advantages and limitations of solar energy as a power source.	5M	CO1	L2
(b)	Compare conventional and non-conventional energy resources.	5M	CO1	L2
(OR)				
3(a)	Outline the construction and working principles of a pyrheliometer.	5M	CO1	L1
(b)	Identify major applications of solar energy in various sectors.	5M	CO1	L3
4(a)	Elaborate the structure of PV module with neat sketch.	5M	CO2	L1
(b)	Analyze how packing density affects the overall efficiency of a solar panel.	5M	CO2	L4
(OR)				
5(a)	Explain the working of off-grid solar power plant.	5M	CO2	L1
(b)	Discuss the role and importance of batteries in solar PV systems.	5M	CO2	L2
6(a)	Describe the construction and working of a solar pond.	5M	CO3	L1
(b)	Elucidate the working of active space solar heating.	5M	CO3	L2
(OR)				
7(a)	Illustrate the design and operation of a central power tower.	5M	CO3	L2
(b)	Explain the principle of solar distillation with a neat sketch.	5M	CO3	L2
8.	Derive the Betz limit and state its significance.	10M	CO4	L3
(OR)				
9(a)	Enumerate the applications of biomass gasifiers.	5M	CO4	L2
(b)	Outline the construction and working of a floating drum biogas plant with a neat sketch.	5M	CO4	L2
10(a)	Classify the different types of geothermal energy resources and explain them.	5M	CO5	L2
(b)	Explain the construction and working of a single-flash geothermal power plant with a neat, labeled diagram.	5M	CO5	L2
(OR)				
11(a)	Classify the different types of fuel cells explain PEM fuel cell anyone.	5M	CO5	L2
(b)	Explain the construction and working of a Hydrogen-Oxygen Fuel Cell with a labeled diagram.	5M	CO5	L2

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

23AD82-FUNDAMENTALS OF DATA SCIENCE

(EEE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	List the features of Python make it suitable for a wide range of applications.	2M	CO1	L1
(b)	Define keys and values in a dictionary and state their differences.	2M	CO1	L1
(c)	Explain Datafication in your own words with a real-life example.	2M	CO2	L1
(d)	List the popular tools used in Data Science.	2M	CO2	L2
(e)	Explain the purpose of Boolean indexing in NumPy.	2M	CO3	L2
(f)	How can you perform ascending and descending sorting on a NumPy array?	2M	CO3	L2
(g)	Explain with an example how Boolean indexing helps in filtering DataFrame entries.	2M	CO4	L2
(h)	In pandas, how do you drop specific columns from a DataFrame.	2M	CO4	L1
(i)	How can you write data to a SQL database using pandas?	2M	CO5	L2
(j)	What are some common file formats used for storing large data, and how does pandas handle them?	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Briefly explain about input and output statements in Python with suitable examples.	5M	CO1	L2
(b)	Describe Python's built-in data types and explain each with a suitable example.	5M	CO2	L2
(OR)				
3(a)	Describe the concept of a tuple in Python. Write a program to perform concatenation, repetition, membership testing, and iteration on tuples.	5M	CO1	L2
(b)	Illustrate how different string functions work in Python with suitable code snippets.	5M	CO1	L2
4(a)	Compare the Data Science Life Cycle with the Data Science Process. Discuss how they differ in terms of their structure, goals, and practical use in solving real-world data problems.	5M	CO2	L2
(b)	Explain the concept of Data Science and discuss why it is important in the current technological landscape.	5M	CO2	L2
(OR)				
5(a)	Explain the concept of Exploratory Data Analysis (EDA) and summarize its role in data science.	5M	CO2	L2
(b)	Explain the role of a Data Scientist in the Data Science process. Discuss the skills required for a data scientist.	5M	CO2	L2
6(a)	Describe the different data types supported by NumPy arrays with examples.	5M	CO3	L2
(b)	How can fancy indexing be used to access specific elements in NumPy arrays? Compare it with regular slicing using examples.	5M	CO3	L2
(OR)				
7(a)	How do logical operators like &, , and ~ function when applied to NumPy arrays?	5M	CO3	L2
(b)	Describe the role of Boolean indexing in conditional data selection using NumPy arrays. Illustrate your answer with at least two use cases and corresponding code snippets.	5M	CO3	L2
8(a)	Summarize the main components of Pandas' architecture and their use in handling and analyzing data.	5M	CO4	L2
(b)	Discuss the purpose and usage of methods such as count(), size(), is_unique(), unique(), head(), and tail().	5M	CO4	L2
(OR)				
9(a)	In Pandas, what are the primary data structures, and how do they vary in terms of their functionality and application.	5M	CO4	L2
(b)	Illustrate the use of reindex() for reordering columns in a DataFrame. How can you reorder columns using a list of new column labels.	5M	CO4	L3
10(a)	Describe the key data cleaning and transformation techniques in pandas. How do these methods contribute to better data quality.	5M	CO5	L2
(b)	Clarify reshaping and pivoting in pandas. How do functions like pivot(), melt(), and stack() help in restructuring data?	5M	CO5	L2
(OR)				
11(a)	Describe the parameters of the drop() method in Pandas. How does each parameter affect the behavior of the function?	5M	CO5	L2
(b)	Illustrate how to select rows and columns based on both conditions and specific labels. Provide an example that combines condition-based filtering and label-based selection.	5M	CO5	L3

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

23ME82-INTRODUCTION TO INDUSTRIAL ROBOTICS

(IT)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	What is meant by automation?	2M	CO1	L1
(b)	Define accuracy and repeatability.	2M	CO1	L1
(c)	Name the three main types of actuators used in robotics.	2M	CO2	L1
(d)	Write one advantage of electrical actuators over hydraulic ones.	2M	CO2	L1
(e)	Define forward kinematics.	2M	CO3	L1
(f)	What is a joint coordinate frame?	2M	CO3	L1
(g)	What is motion interpolation?	2M	CO4	L1
(h)	Mention one benefit of simulation-based programming.	2M	CO4	L1
(i)	What is image preprocessing?	2M	CO5	L1
(j)	What is the role of machine vision in quality control?	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Classify robots based on their coordinate systems with suitable sketches.	5M	CO1	L2
(b)	Illustrate the concept of the workspace of a robot and the factors affecting it.	5M	CO1	L2
(OR)				
3(a)	Explain the relationship between CAD/CAM and robotics in modern manufacturing.	5M	CO1	L2
(b)	Explain the importance of sensors and actuators in robot anatomy.	5M	CO1	L2
4(a)	Describe the working principle of a hydraulic actuator with a neat diagram.	5M	CO2	L2
(b)	Explain how LVDT can be used for position measurement.	5M	CO2	L2
(OR)				
5(a)	Discuss the cost and control aspects of actuator selection.	5M	CO2	L2
(b)	Describe the integration of sensors with microcontrollers.	5M	CO2	L2
6(a)	Justify the need for the representation of matrices in the homogeneous form in the case of transformations of the frames.	5M	CO3	L2
(b)	Calculate the inverse of the following transformation matrix. $\begin{bmatrix} 0.5 & 0 & 0.866 & 3 \\ 0.866 & 0 & -5 & 2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	5M	CO3	L3
(OR)				
7.	Illustrate in detail the Denavit-Hartenberg representation of the forward kinematics of robots.	10M	CO3	L3
8(a)	Compare Python, RAPID, and URScript languages for robotic control.	5M	CO4	L2
(b)	Illustrate motion interpolation methods in robots.	5M	CO4	L2
(OR)				
9.	A 2-DOF planar robot is to follow a straight line in Cartesian space between the start (2, 6) and the end (12, 3) points of the motion segment. Find the joint variables for the robot if the path is divided into 10 sections. Each link is 9 inches long. Use either graphical approach or analytical approach.	10M	CO4	L3
10(a)	Compare supervised and unsupervised learning in vision training.	5M	CO5	L2
(b)	Discuss the use of machine vision in quality inspection.	5M	CO5	L2
(OR)				
11(a)	Explain the application of underwater robots (ROVs/AUVs) for deep-sea exploration and maintenance.	5M	CO5	L2
(b)	Describe the use of service robots in hospitality, cleaning, and customer support environments.	5M	CO5	L2

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

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

23EE84-ELECTRIC VEHICLES

(ME)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	List out merits of Electric Vehicles over conventional vehicles.	2 M	CO1	L2
(b)	Define Rolling resistance of a vehicle.	2 M	CO1	L1
(c)	Classify various types of batteries.	2 M	CO2	L2
(d)	Give some of the applications of secondary cells.	2 M	CO2	L2
(e)	Describe the role of commutator in DC motors.	2 M	CO3	L2
(f)	Outline the operation of a DC motor in first quadrant.	2 M	CO3	L2
(g)	What is the responsibility of Electric Vehicle Drive train?	2 M	CO4	L2
(h)	Define Power train of a vehicle.	2 M	CO4	L1
(i)	Discuss how Pontryagin's minimum principle contribute in sizing methodology of Hybrid Electric Vehicles.	2 M	CO5	L2
(j)	Classify various types of Hybrid Electric Vehicles based on Degree.	2 M	CO5	L2
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Differentiate the working procedures of Internal Combustion Engine (ICM) and Electric Motor (EM) to produce propulsion in vehicles.	5 M	CO1	L2
(b)	Describe various forces acting on a vehicle with relevant sketches and clearly mention each type of force direction.	5 M	CO1	L2
(OR)				
3.	Illustrate the configurational block diagram of an Electric Vehicle with major components.	10 M	CO1	L3
4(a)	Define battery and describe various battery parts and it's working with a neat sketch.	5 M	CO2	L2
(b)	Outline and discuss various applications of Battery pack design.	5 M	CO2	L2
(OR)				
5(a)	Interpret battery SOC in detail with suitable formulae.	5 M	CO2	L2
(b)	A 12V battery with capacity of 500Ah is at 80% SOC. Determine the following parameters of the battery (i) Charge Stored in the battery (ii) Energy Delivered to the Load from battery.	5 M	CO2	L3
6(a)	Illustrate the construction and principle of operation of a switched reluctance motor used in Electric Vehicles.	5 M	CO3	L3
(b)	List out and briefly explain various DC Motors used in Electric Vehicles application.	5 M	CO3	L2
(OR)				
7.	Describe the process of speed control in an induction motor using a variable frequency drive operating on the V/f principle.	10M	CO3	L2
8(a)	Interpret Modern Electric Vehicle Drive Train configuration with all subsystems with a neat block diagram and discuss their functions.	5 M	CO4	L2
(b)	Illustrate re-regenerative braking with a neat sketch with respective to Electrical Vehicles.	5 M	CO4	L3
(OR)				
9.	Classify and elaborate various EV drive train alternative configurations with neat block diagrams.	10 M	CO4	L3
10(a)	Summarize about Hybrid Electric Vehicles.	5 M	CO5	L2
(b)	Distinguish various Hybrid Electric Vehicles based on their power flow Mechanical (MPTP) as well as Electrical (EPTP).	5 M	CO5	L2
(OR)				
11(a)	Outline the Vehicle Modelling methodology for components sizing of hybrid electric vehicles for maximum optimization utility with the help of a schematic power train.	5 M	CO5	L3
(b)	List out advantages and disadvantages of a Parallel drive train in design of Hybrid Electric vehicles.	5 M	CO5	L2

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations**23AD07-EXPLORATORY DATA ANALYSIS WITH PYTHON**

(AI&DS)

Time : 3 hours

Max. Marks: 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	You are given a pandas DataFrame sales_data with columns ['Date', 'Region', 'Revenue', 'Units_Sold']. Write a Python code snippet to identify the number of missing values in each column of this DataFrame.	2M	CO1	L3
(b)	Analyze the primary difference in approach and goals between Exploratory Data Analysis (EDA) and Bayesian Analysis. How does their treatment of assumptions differ.	2M	CO1	L3
(c)	You are given a pandas DataFrame student_performance which contains the columns 'math_score' and 'reading_score'. Write the Python code using the Seaborn library to generate a scatter plot to visualize the potential relationship between these two scores.	2M	CO2	L3
(d)	In the context of the "EDA with Personal Email" case study, explain the necessity of data transformation. Provide one example of a transformation you would apply to the raw timestamp data (e.g., 'Wed, 15 Oct 2025 01:20:00 +0530') extracted from an email header.	2M	CO2	L2
(e)	You are given a pandas DataFrame df with columns ['Name', 'Month', 'Sales']. Write the Python code to pivot this DataFrame so that each unique Name is an index, each Month becomes a new column, and the cell values are the corresponding Sales.	2M	CO3	L3
(f)	Explain the purpose of discretization and binning. Provide a practical example where transforming a continuous numerical feature (like 'Age') into a categorical one (like 'Age Group') would be beneficial for analysis.	2M	CO3	L2
(g)	You are given a pandas DataFrame sales_data with columns ['Region', 'Product_Category', 'Sales']. Write the Python code to group this data by Region and then calculate the total Sales for each region.	2M	CO4	L3
(h)	Explain what a leptokurtic distribution signifies. What does this type of kurtosis tell you about the tails and the central peak of the data distribution when compared to a normal (mesokurtic) distribution?	2M	CO4	L2
(i)	You are tasked with creating a training set and a testing set from the Wine Quality dataset to build a supervised learning model. Describe the process you would follow to split the data, and explain the importance of stratification in this specific context.	2M	CO5	L3
(j)	Imagine you have trained two different classification models to predict wine quality (e.g., 'good' vs. 'bad'). Model A has a high accuracy but low recall, while Model B has high recall but lower accuracy. Justify which model you would choose for a scenario where failing to identify a 'good' quality wine is a more costly error than misclassifying a 'bad' one.	2M	CO5	L3
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain the difference between nominal and ordinal categorical data. For each of the four specific types (discrete, continuous, nominal, ordinal), provide a clear example and justify why it fits that category.	5M	CO1	L3
(b)	Differentiate between Numerical and Categorical data. Further, explain the difference between discrete and continuous numerical data.	5M	CO2	L2
(OR)				
3(a)	Explain the role of domain knowledge in Exploratory Data Analysis. Provide a detailed, hypothetical example using a dataset from a specific domain (e.g., healthcare, finance, or retail). In your example, show how a data analyst with domain knowledge might interpret a finding (like an outlier or a strange correlation) differently and more effectively than an analyst without it.	5M	CO1	L4
(b)	Write a complete Python script that performs the absolute first steps of EDA. Your script must: (i) Import the pandas library (ii) Load the housing.csv dataset into a DataFrame called df (iii) Display the first 7 rows to inspect the data (iv) Display the last 7 rows to see the end of the data (v) Use a single pandas command to get a concise summary of the DataFrame, including the index dtype, column dtypes, non-null values, and memory usage (vi) Generate and display the basic descriptive statistics for all numerical columns.	5M	CO2	L3

23AD07-EXPLORATORY DATA ANALYSIS WITH PYTHON

4	You want to compare the total number of emails you have sent versus the number of emails you have received for each day of the week. Evaluate the suitability of a stacked bar chart versus a grouped bar chart for this specific task. Critique the potential for misinterpretation with the stacked bar chart.	10M	CO2	L3
(OR)				
5(a)	Data refactoring involves creating more insightful features from existing data. Using the email case study, describe the process of refactoring the sender's full email address (e.g., john.smith@university.ac.in) into a more useful categorical feature like sender_category (e.g., 'Academic', 'Personal', 'Promotional'). Explain the logic you would use to perform this categorization.	5M	CO2	L3
(b)	An analyst decides to show the distribution of emails received per hour (0-23) using a standard pie chart with 24 slices. Write a detailed critique of this visualization choice. Evaluate its effectiveness by discussing at least two major weaknesses of using a pie chart for this type of data (e.g., difficulty in comparing slice sizes, violation of the part-to-whole concept).	5M	CO2	L3
6(a)	Describe in detail five distinct benefits of performing data transformation during the data analysis and machine learning workflow. For each benefit, provide a clear example of a transformation technique that helps achieve it.	5M	CO3	L3
(b)	You are given two DataFrames, df_A and df_B, with the same number of rows. Write a Python script to perform two separate concatenation operations: (i) Row-wise: Stack df_B below df_A (concatenating along axis=0). (ii) Column-wise: Place df_B to the right of df_A (concatenating along axis=1). For each operation, explain the resulting structure of the final DataFrame.	5M	CO3	L3
(OR)				
7(a)	These two techniques are used to reorder or subset data for different purposes. Contrast permutation (shuffling) with random sampling. Define each technique and explain their distinct goals.	5M	CO3	L2
(b)	While similar, pivot_table is a more powerful and flexible function than pivot. Analyze the key difference between these two functions, focusing on how they handle duplicate index/column pairs. Explain the role of the aggfunc parameter in pivot_table.	5M	CO3	L3
8(a)	Given the following small dataset: [4, 6, 10, 8, 7] Showing your work step-by-step, calculate the variance and the standard deviation for this population data.	5M	CO4	L3
(b)	Decomposition allows us to isolate the individual components of a time series. Explain the concept of time series decomposition. Differentiate between an additive and a multiplicative decomposition model, describing the conditions under which each is appropriate.	5M	CO4	L3
(OR)				
9.	A dataset of house prices contains a data entry error, listing one house for \$2 billion instead of \$200,000. Evaluate the impact of this single extreme outlier on the following four statistics: <i>Mean, Median, Range, Interquartile Range (IQR)</i> For each statistic, state whether it is robust or sensitive to the outlier and justify why.	10M	CO4	L3
10(a)	Implement a GridSearchCV to find the best hyperparameters for a RandomForestClassifier on the Wine Quality dataset. Your search should tune at least two hyperparameters (e.g., n_estimators and max_depth). Print the best parameter combination and the corresponding validation score.	5M	CO5	L3
(b)	Explain the process of k-fold cross-validation. How does this technique provide a more reliable estimate of model performance compared to a single train-test split?	5M	CO5	L3
(OR)				
11(a)	Using the binary classification task from the Wine Quality dataset (good vs. bad wine), discuss which of these metrics you believe is most critical for a wine producer and justify your choice. For instance, is it worse to misclassify a bad wine as good, or a good wine as bad?	5M	CO5	L3
(b)	Before complex modeling, establishing a baseline is crucial. For this question, reframe the wine 'quality' score as a binary classification task where quality > 5 is 'good' (1) and quality <= 5 is 'bad' (0). Create, train, and evaluate a Logistic Regression model using scikit-learn. Use all other columns as features. Split your data, train the model, and report the accuracy, precision, and recall on the test set. This will serve as your baseline model.	5M	CO5	L3

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

23AE11-FINITE ELEMENT ANALYSIS

(ASE)

Time : 3 hours

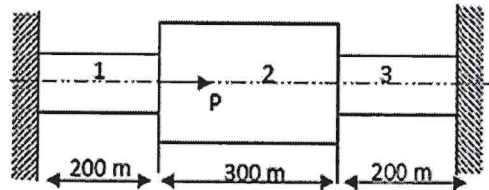
Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	List the common types of elements used in FEM.	2M	CO1	L1
(b)	What is the principle of minimum potential energy?	2M	CO1	L1
(c)	Give examples of 2D elements used in FEM.	2M	CO2	L2
(d)	Why is the strain constant in a CST element?	2M	CO2	L1
(e)	Write the general displacement field for an axisymmetric body.	2M	CO3	L1
(f)	How does numerical integration affect the accuracy of stiffness matrix computation?	2M	CO3	L1
(g)	Differentiate between plane truss and space truss.	2M	CO4	L4
(h)	Recall the relationship of Hermitian matrix in beam element.	2M	CO4	L1
(i)	What do you understand by mode shapes?	2M	CO5	L1
(j)	How principle of minimum potential energy is useful in dynamic analysis of systems?	2M	CO5	L1

Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Derive the equilibrium equations for 3-D body.	5M	CO1	L3
(b)	Briefly discuss the Rayleigh Ritz method in solving FEA analysis.	5M	CO1	L2

(OR)

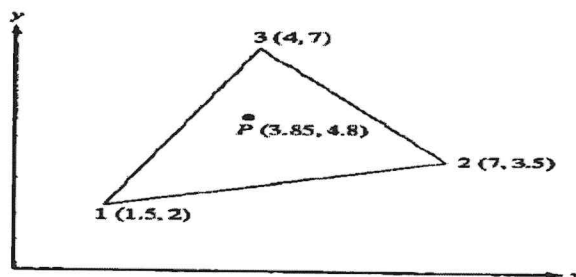
3.	An axial load $P = 200 \times 10^3$ N is applied on a bar shown in figure, determine nodal displacements, stress in each material and reaction forces. If $A_1 = 2400 \text{ mm}^2$, $A_2 = 600 \text{ mm}^2$, $A_3 = 2000 \text{ mm}^2$, $E_1 = 70 \text{ GPa}$, $E_2 = 200 \text{ GPa}$, $E_3 = 67 \text{ GPa}$.	10 M	CO1	L3
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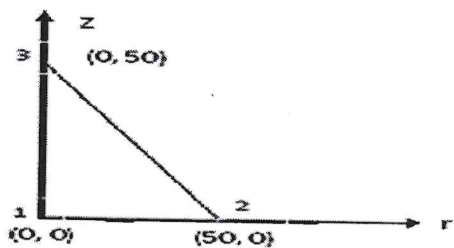
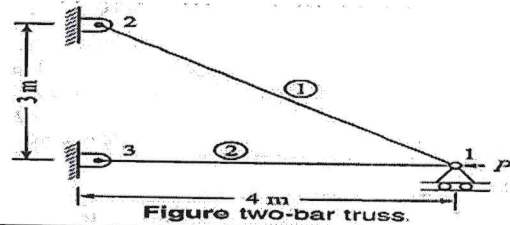
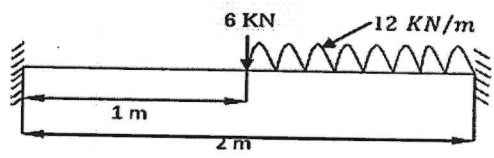
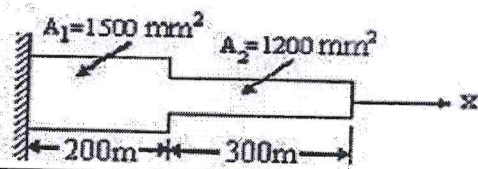
4(a)	Explain the finite element modeling in CST element.	5M	CO2	L2
(b)	Why the above element is popularly known as CST? Discuss about the advantages and disadvantages of the element.	5M	CO2	L1

(OR)

5(a)	Derive the Jacobian matrix for a CST element with neat figure.	5M	CO3	L3
(b)	Determine The Shape Functions N_1 , N_2 and N_3 , At The Interior Point P for The Triangular Element Shown in Fig.	5M	CO3	L3



23AE11-FINITE ELEMENT ANALYSIS

6(a)	Describe the shape functions in natural coordinates for 2-D Quadrilateral element.	5M	CO3	L3
(b)	For axisymmetric element shown in figure, determine the strain-displacement matrix [B]. Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates shown in figure are in millimeters. 	5M	CO3	L3
(OR)				
7(a)	Explain the concept of numerical integration and its utility in generating Isoperimetric finite element matrices.	5M	CO3	L2
(b)	compute the integral using one point and two point Gauss Quadrature. $\int_{-1}^{+1} \left[3e^x + 2x^2 + \frac{1}{(3x+4)} \right] dx$	5M	CO3	L3
(OR)				
8(a)	What are the characteristics of a truss?	5M	CO4	L3
(b)	For the two-bar truss shown in Figure below, determine the element stiffness matrix, nodal displacements. A force of $P=1000\text{kN}$ is applied at node 1. Assume $E=210\text{GPa}$ and $A=600\text{mm}^2$ for each element.  Figure two-bar truss.	5M	CO4	L3
(OR)				
9.	For the beam and loading shown in fig. calculate the nodal displacements. Take $[E] = 210 \text{ GPa} = 210 \times 10^9 \text{ N/m}^2$; $[I] = 6 \times 10^{-6} \text{ m}^4$. 	10M	CO4	L3
(OR)				
10(a)	Explain the formulation of Hamilton's principle.	5M	CO5	L2
(b)	Write down the properties of Eigen Vectors.	5M	CO5	L1
(OR)				
11.	Determine the natural frequencies and mode shapes of a stepped bar shown in figure below. Assume $E=300\text{GPa}$ and density is 7800Kg/m^3. 	10M	CO5	L3

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

23CE13-CONSTRUCTION TECHNOLOGY AND MANAGEMENT

(CE)

Time: 3 hours

Max. Marks: 70

Q.No	Compulsory Question	Marks	CO	BL																														
1(a)	Define Earliest Start time (EST), Earliest Finish Time (EFT), Latest Start time (LST) and Latest Finish Time (LFT).	2M	CO1	L1																														
(b)	Define Total float and Free float.	2M	CO1	L1																														
(c)	State the objectives of Resource allocation.	2M	CO1	L1																														
(d)	Define Normal cost and Normal duration of a project.	2M	CO1	L1																														
(e)	List out the parameters considered under operating cost.	2M	CO2	L1																														
(f)	A vehicle moves at 30 km/h during hauling over a haul distance of 6km. Calculate the hauling time.	2M	CO2	L2																														
(g)	Differentiate between internal and surface vibrators.	2M	CO3	L1																														
(h)	Differentiate the function of curing box and curing tents.	2M	CO3	L1																														
(i)	List out the various materials used in Formwork.	2M	CO2	L1																														
(j)	List out the loads acting on formwork.	2M	CO2	L1																														
Q.No	All questions carry equal marks	Marks	CO	BL																														
2(a)	Describe the various stages in the Construction of a project.	5M	CO1	L2																														
(b)	Discuss the duties, roles and responsibilities of a project manager.	5M	CO1	L2																														
(OR)																																		
3(a)	Illustrate the concept of Scheduling in project management.	5M	CO1	L2																														
(b)	Illustrate the advantages and disadvantages of Mile stone chart over Bar chart in Construction management.	5M	CO1	L2																														
4.	Draw the network, determine the cost slope. Determine the total cost of the project if indirect cost is Rs 4000 per week. Draw the time scale version of the network. <table><tr><th>Activity</th><th>Normal Duration, T_n</th><th>Normal cost, C_n</th><th>Crash duration, T_c</th><th>Crash Cost, C_c</th></tr><tr><td>1-2</td><td>6</td><td>8000</td><td>3</td><td>14000</td></tr><tr><td>1-3</td><td>8</td><td>4000</td><td>5</td><td>8000</td></tr><tr><td>2-3</td><td>4</td><td>6000</td><td>1</td><td>9000</td></tr><tr><td>2-4</td><td>5</td><td>8000</td><td>3</td><td>15000</td></tr><tr><td>3-4</td><td>5</td><td>5000</td><td>3</td><td>11000</td></tr></table>	Activity	Normal Duration, T _n	Normal cost, C _n	Crash duration, T _c	Crash Cost, C _c	1-2	6	8000	3	14000	1-3	8	4000	5	8000	2-3	4	6000	1	9000	2-4	5	8000	3	15000	3-4	5	5000	3	11000	10M	CO4	L3
Activity	Normal Duration, T _n	Normal cost, C _n	Crash duration, T _c	Crash Cost, C _c																														
1-2	6	8000	3	14000																														
1-3	8	4000	5	8000																														
2-3	4	6000	1	9000																														
2-4	5	8000	3	15000																														
3-4	5	5000	3	11000																														
(OR)																																		
5(a)	Explain the concept of Resource smoothing using an example.	5M	CO1	L2																														
(b)	Discuss the steps for Project planning with Primavera and the key Primavera features for planning a project.	5M	CO1	L2																														
6(a)	List out the different types of tractors used in construction.	5M	CO2	L2																														
(b)	Describe the purpose, working and applications of a Clamshell bucket.	5M	CO2	L2																														
(OR)																																		
7.	Estimate the owning and operating cost using the following data: Engine capacity: 100 HP, diesel powered, Crank case capacity: 30L, Time between oil changes: 150 hours, Operating factor: 0.6, Useful life: 5 years, Hours used per year: 2000, Total initial cost: Rs. 5 lakhs, Salvage value: Rs. 50,000. Assume any other suitable data.	10M	CO2	L3																														
8(a)	Explain the methods of consolidation using (i) Self consolidation (ii) Vibration.	5M	CO3	L2																														
(b)	Describe the types and operations carried out using Membrane curing.	5M	CO3	L2																														
(OR)																																		
9(a)	Illustrate the working of Roller-pan mixture.	5M	CO3	L2																														
(b)	Discuss the transportation equipment used for high rise construction and specific site construction.	5M	CO3	L2																														
10(a)	Discuss the salient features of providing formwork in columns.	5M	CO2	L2																														
(b)	Highlight the sampling and documentation of the quality control aspects related to construction activities.	5M	CO2	L2																														
(OR)																																		
11(a)	State the purpose of piling. Describe the installation of precast piles and bored piles at the site.	5M	CO2	L2																														
(b)	List out the risks associated with the Manual work with hazardous equipment and identify the approaches to mitigate the risks.	5M	CO2	L2																														

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

23AD02-ARTIFICIAL INTELLIGENCE

(CSE & IT)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Define the characteristics of a problem.	2M	CO1	L1
(b)	Define rationality.	2M	CO1	L1
(c)	Explain evaluation function.	2M	CO2	L2
(d)	Define adversarial search.	2M	CO2	L1
(e)	List knowledge representation schemes.	2M	CO3	L1
(f)	What is Reasoning under uncertainty?	2M	CO3	L1
(g)	What is resolution?	2M	CO4	L1
(h)	What do you mean by unification?	2M	CO4	L1
(i)	Describe any two features of MYCIN Expert System.	2M	CO5	L2
(j)	Define expert system.	2M	CO5	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	What is agent, Explain types of agents?	5M	CO1	L2
(b)	Define artificial intelligence. What goals are such systems design to achieve?	5M	CO1	L2
(OR)				
3(a)	Analyze the nature of environments and relate them to AI problem-solving.	5M	CO1	L4
(b)	Illustrate about structure of agent with example.	5M	CO1	L3
4.	Apply A* algorithm on the below graph to find the optimal path from node 'a' to node 'z' and also explain A* algorithm in detail.	10M	CO2	L3
(OR)				
5(a)	Describe the concept of Hill climbing and its problems.	5M	CO2	L2
(b)	Explain uninformed search strategies and its disadvantages.	5M	CO2	L2
6.	Explain Issues in Knowledge Representation.	10M	CO3	L2
(OR)				
7(a)	Draw semantic network for the given knowledge and answer the query "Does the cat sit on the mat?" Tom is an instance of dog. Tom caught a cat. Tom is owned by roshan. Tom is brown in colour. Dogs like bones. The dog sat on the mat. A dog is a mammal. A cat is an instance animal. All mammals are animals. Mammals have fur.	5M	CO3	L3
(b)	Discuss Baye's rule and its use with example.	5M	CO3	L3
8(a)	Explain Reinforcement Learning.	5M	CO4	L2
(b)	Differentiate between Propositional Logic and First Order Logic Inference.	5M	CO4	L2
(OR)				
9(a)	Demonstrate the concept of Explanation based learning with example.	5M	CO4	L3
(b)	Explain Unification with example.	5M	CO4	L2
10(a)	Explain the concept of DART Expert System.	5M	CO5	L2
(b)	Describe the architecture of Expert Systems.	5M	CO5	L2
(OR)				
11(a)	Explain the concept of Expert Systems shell.	5M	CO5	L2
(b)	Discuss in detail about various knowledge acquisition techniques.	5M	CO5	L2

0-9 JUN 1958

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

B.Tech. (V Semester) ~~Regular~~/Supplementary Examinations

23EC27-COMMUNICATION SYSTEMS

(EEE)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	List out different types of analog modulation schemes.	2M	CO1	L1
(b)	Explain the terms over modulation, under modulation and 100% modulation with respect to AM.	2M	CO1	L1
(c)	What is the difference between direct and indirect methods of FM generation?	2M	CO2	L2
(d)	Give the comparisons between AM and FM.	2M	CO2	L2
(e)	Define selectivity and fidelity with respect to AM receivers.	2M	CO3	L1
(f)	What is the need for heterodyning in radio receivers?	2M	CO3	L2
(g)	Explain aliasing in sampling.	2M	CO1	L1
(h)	Distinguish between PWM and PPM.	2M	CO2	L2
(i)	What is quantization? Mention the different noise effects in Delta Modulation.	2M	CO1	L1
(j)	Define ASK.	2M	CO1	L1
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Explain the function of each block of a communication system.	5M	CO1	L2
(b)	An AM transmitter has an un-modulated carrier power of 10KW. Find the total transmitted power when the modulation index is (i) 10% (ii) 50% (iii) 100%. Comment on the result obtained.	5M	CO4	L3
(OR)				
3(a)	Interpret the detection of AM signal using envelope detector.	5M	CO2	L2
(b)	A 400W carrier is modulated on a depth of 50%. Calculate the total power transmitted power and sideband power.	5M	CO4	L3
4.	Discuss the generation of FM using Armstrong method with necessary phasors.	10M	CO2	L2
(OR)				
5(a)	Define angle modulation. Explain different types of angle modulations with mathematical expressions.	5M	CO2	L2
(b)	A 20MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is (i) 1 kHz (ii) 15 kHz.	5M	CO4	L3
6(a)	Explain with neat diagram the working of a superheterodyne AM receiver.	5M	CO3	L2
(b)	An AM transmitter is operating at a carrier power of 100 W with a modulation index of 0.6. Calculate the total transmitted power and the power in each sideband.	5M	CO4	L3
(OR)				
7(a)	Describe the classification of noise in communication systems and explain any three internal noise sources.	5M	CO3	L2
(b)	A broadcast radio station transmits at a carrier frequency of 1 MHz with an IF of 455 kHz. Determine the local oscillator frequency required for proper tuning. Also, explain the need for heterodyning.	5M	CO4	L3
8(a)	State and explain the sampling theorem. Illustrate with a neat diagram the effect of under-sampling.	5M	CO1	L2
(b)	A signal of maximum frequency 3 kHz is sampled at 4 kHz. Verify whether the sampling theorem is satisfied. If not, determine the minimum sampling frequency required.	5M	CO4	L3
(OR)				
9.	Discriminate the input and output waveforms for the PAM, PWM and PPM with brief explanation.	10M	CO2	L2
10(a)	Explain the principle of Delta Modulation (DM) with a neat block diagram. What are the drawbacks of DM?	5M	CO2	L2
(b)	Elucidate how ADM performs better than DM.	5M	CO2	L2
(OR)				
11.	Define BPSK and discuss BPSK transmitter and receiver with relevant diagrams.	10M	CO2	L2

08 JUN 2026

H.T.No

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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

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

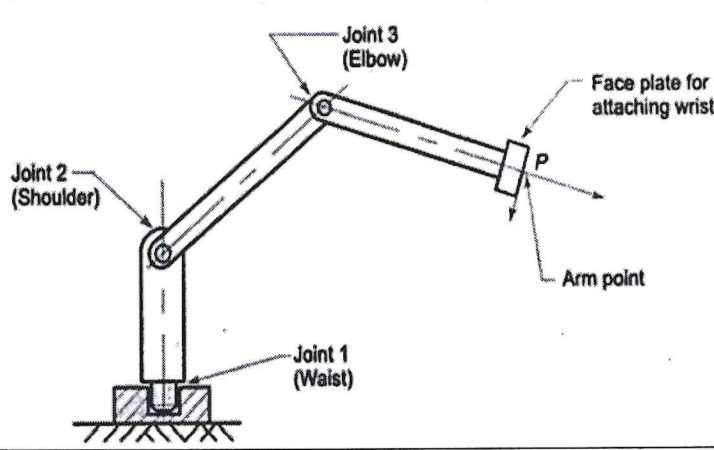
23ME16-INDUSTRIAL ROBOTICS

(ME)

Time : 3 hours

Max. Marks : 70

Q.No	Compulsory Question	Marks	CO	BL
1(a)	Express the work volumes of the following two types of robotic arms. (i) Cartesian configuration (ii) Polar configuration.	2 M	CO1	L2
(b)	State the three laws of robots proposed by Isaac Asimov.	2 M	CO1	L1
(c)	List the actuators used in robotic systems.	2 M	CO2	L2
(d)	Provide the relation between input voltage (V_s) and output voltage (V_{out}) of a potentiometer.	2 M	CO2	L2
(e)	State any two important properties of rotation matrix.	2 M	CO3	L1
(f)	Mention the D-H parameters used in forward kinematics.	2 M	CO3	L1
(g)	Differentiate joint space and cartesian space trajectory planning.	2 M	CO4	L2
(h)	Distinguish the terms "path" and "trajectory".	2 M	CO4	L2
(i)	State the three phases of analog-to- digital signal conversion.	2 M	CO5	L1
(j)	Define the term "Machine vision".	2 M	CO5	L1
(OR)				
Q.No	All questions carry equal marks	Marks	CO	BL
2(a)	Describe the anatomy of a robot and illustrate it with a sketch.	5 M	CO1	L2
(b)	Describe the emerging and future applications of industrial robots.	5 M	CO1	L2
(OR)				
3(a)	Explain how a robot is specified in terms of its key parameters.	5 M	CO1	L2
(b)	Describe in detail the mechanical grippers used in robotic systems.	5 M	CO1	L2
(OR)				
4(a)	Compare the features of actuating systems used in robots.	5 M	CO2	L2
(b)	Explain the working of strain gauge used to measure forces in robots.	5 M	CO2	L2
(OR)				
5(a)	List the actuators used in robotic systems. Briefly describe the features of each type of actuator.	5 M	CO2	L2
(b)	Enumerate different types of sensors used in robotic systems.	5 M	CO2	L1
(OR)				
6(a)	A point $P(7,3,1)^T$ is attached to a frame F_{noa} and is subjected to the following transformations. Calculate the coordinates of the point relative to the reference frame at the conclusion of transformations. (i) Rotation of 90° about the a-axis, (ii) Then a translation of $[4,-3,7]$ along n,o,a axes.	5 M	CO3	L4
(b)	Calculate the inverse of the following transformation matrix. $\begin{bmatrix} 0.5 & 0 & 0.866 & 3 \\ 0.866 & 0 & -5 & 2 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	5 M	CO3	L4
(OR)				

7.	Formulate the forward kinematic model for a 3-DOF articulated arm given.		10 M	CO3	L4
8(a)	Distinguish Joint space and Cartesian space descriptions.	5 M	CO4	L3	
(b)	Discuss the motion interpolation in robot programming.	5 M	CO4	L3	
(OR)					
9.	A 2-DOF planar robot is to follow a straight line in Cartesian-space between the start (2, 6) and the end (12, 3) points of the motion segment. Compute the joint variables for the robot if the path is divided into 10 sections. Each link is 9 inches long.	10 M	CO4	L3	
10(a)	Describe the "Feature extraction" function required for image processing and analysis.	5 M	CO5	L2	
(b)	Discuss the lighting techniques required for a vision system.	5 M	CO5	L2	
(OR)					
11(a)	Explain the three main functions in the operation of the machine vision system used in robots.	5 M	CO5	L2	
(b)	Illustrate the following applications of machine vision. (i) Inspection (ii) Identification (iii) Visual serving and navigation.	5 M	CO5	L2	
