LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)
L.B. Reddy Nagar :: Mylavaram-521 230 :: Krishna Dist. :: A.P
Approved by AICTE, New Delhi. Affiliated to JNTUK, Kakinada

M.Tech.(I Semester) (R20) Regular Examinations, July / August 2021

TIME TABLE

TIME :10.00 AM to 01.00 PM A.Y. 2020-21

Date	VLSI and Embedded Systems	Thermal Engineering
27-07-2021 (Tuesday)	20VE01 - Digital VLSI System Design	20TE01 - Advanced Thermodynamics
29-07-2021 (Thursday)	20VE02 - Embedded System Design	20TE02 - Advanced Heat and Mass Transfer
31-07-2021 (Saturday)	20VE03 - Cryptography and Network Security	20TE03 - Advanced Fluid Mechanics
02-08-2021 (Monday)	20VE06 - Image and Video Processing	20TE06 - IC Engines and Alternate Fuels
04-08-2021 (Wednesday)	20RM01 - Research Methodology and IPR	20RM01 - Research Methodology and IPR

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

13/07/2021

Date: 13-07-2021 CONTROLLER OF EXAMINATIONS PRINCIPAL 13/7/21

Copy to:
1. Vice-Principal, Deans & HoDs
2. Transport in-charge & Librarian
3. Canteen, Security & Hostels
4. All Notice Boards

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LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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

M.Tech. (I Semester) Regular Examinations

20RM01-RESEARCH METHODOLOGY AND IPR

(VLSI&ES and TE)

Time : 3 hours　　　　Max. Marks : 60

Answer one question from each unit
All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	What do you understand by term Research Problem? What are the objectives of Research Problem?	6M	CO1	L2
(b)	Explain different sources of research problem by giving suitable examples under source.	6M	CO1	L2
	(OR)			
2(a)	Discuss the objective of research.	6M	CO1	L2
(b)	Distinguish between Research methods and Research methodology.	6M	CO1	L2
3(a)	Distinguish between Research methods and Research methodology.	6M	CO1	L2
(b)	Outline about the Format of research proposal.	6M	CO1	L2
	(OR)			
4(a)	What are the items in a research report? Explain them in brief.	6M	CO2	L2
(b)	Discuss the guidelines for preparing bibliography.	6M	CO2	L2
5.	Explain about different type of Intellectual Properties.	12M	CO4	L2
	(OR)			
6(a)	Discuss the process of patenting and development.	6M	CO4	L2
(b)	What kind of information is presented in a typical patent document?	6M	CO4	L2
7(a)	Discuss the administration of Patent System.	6M	CO4	L2
(b)	Compare patent rights and IPR.	6M	CO4	L2
	(OR)			
8(a)	Describe briefly how the online patent data is organized.	6M	CO4	L2
(b)	Explain the inventions that are patentable and not patentable in India.	6M	CO4	L2
9(a)	What is Novelty Search? Why Novelty Search is important?	6M	CO5	L2
(b)	Write briefly about New developments in IPR.	6M	CO5	L2
	(OR)			
10(a)	Discuss the advantages and disadvantages of getting copy rights for software rather than patent.	6M	CO5	L2
(b)	What are the limitations of IP based protection for Traditional Knowledge?	6M	CO3	L2

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M.Tech. (I Semester) Regular Examinations

20VE06-IMAGE AND VIDEO PROCESSING

(VLSI&ES)

Time : 3 hours Max. Marks : 60

Answer one question from each unit

All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Define digital image. How a digital image can be represented? List out the advantages and disadvantages along with applications.	6M	CO1	L2
(b)	Summarize different properties of Fourier transforms with associated mathematical expressions.	6M	CO1	L2
	(OR)			
2(a)	State and prove the linearity and seperability properties of 2D DFT.	6M	CO1	L2
(b)	List different distance measures between pixels. Give necessary relations with explanation.	6M	CO1	L2
3(a)	Define image enhancement. Give the list of different image enhancement techniques with a brief note.	6M	CO2	L2
(b)	Describe about smoothing spatial filters.	6M	CO2	L2
	(OR)			
4.	Obtain Histogram equalization for the following image segment of size 5 x 5. Write the inference on image segment before and after equalization. 20 20 20 18 16 15 15 16 18 15 15 15 19 15 17 16 17 19 18 16 20 18 17 20 15	12M	CO2	L3
5(a)	Discuss about different types of Image compression techniques with a brief note.	6M	CO3	L2
(b)	Illustrate the process of bit plane coding in image compression.	6M	CO3	L2
	(OR)			
6(a)	Explain the following terms (i) Compression (ii) Redundancy.	6M	CO3	L2
(b)	Create a code for given set of symbols with probabilities using Huffman coding technique. a1 0.1 a2 0.4 a3 0.06 a4 0.1 a5 0.04 a6 0.3	6M	CO3	L3
7(a)	Differentiate between rigid motion in the Cartesian and homogeneous coordinates.	6M	CO4	L2
(b)	Draw the sampling structures for digital video.	6M	CO4	L2
	(OR)			
8(a)	What is the necessity of digital video? Explain in brief about digital video signal, digital video standards.	6M	CO4	L2
(b)	List the types of geometric image formation models and explain them.	6M	CO4	L2
9.	Discuss about block based motion estimation.	12M	CO5	L2
	(OR)			
10(a)	Discuss the role of optical flow equation in video processing.	6M	CO5	L2
(b)	Discuss about global motion estimation.	6M	CO5	L2

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M.Tech. (I Semester) Regular Examinations

20VE03-CRYPTOGRAPHY AND NETWORK SECURITY

(VLSI&ES)

Time : 3 hours Max. Marks : 60

Answer one question from each unit
All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Explain the operations, requirements, components of Network security model.	6M	CO1	L1
(b)	Enumerate the security mechanisms defined by X.800. Explain each.	6M	CO2	L2
	(OR)			
2(a)	Briefly define the monoalphabetic cipher. What is the difference between a monoalphabetic cipher and a polyalphabetic cipher?	6M	CO2	L2
(b)	Perform Encryption and decryption using Hill Cipher for the following Message PEN and Key: ACTIVATED.	6M	CO2	L3
3(a)	Explain in detail Feistel Block Cipher structure with neat sketch.	6M	CO3	L2
(b)	Describe key discarding process of DES algoritm.	6M	CO3	L2
	(OR)			
4(a)	Describe RSA Algorithm and Estimate the encryption and decryption values for the RSA algorithm parameters.	6M	CO3	L2
(b)	Explain Diffie-Hellman Key Exchange algorithm with its merits and demeritis.	6M	CO3	L2
5(a)	Describe the Chinese remainder theorem.	6M	CO3	L2
(b)	State Euler's theorem to find the gcd with example.	6M	CO3	L3
	(OR)			
6(a)	Illustrate in detail about the message authentication code and its requirements.	6M	CO3	L2
(b)	What are the types of attacks addressed by message authentication? Explain.	6M	CO3	L1
7(a)	Write and explain the digital signature algorithm.	6M	CO4	L1
(b)	Give an overview of Kerberos 4 dialogue.	6M	CO4	L1
	(OR)			
8(a)	Give the structure of HMAC. Explain the applications of HMAC.	6M	CO4	L1
(b)	Write about the usage of session keys, Public and Private keys in PGP.	6M	CO4	L1
9(a)	Briefly explain Encapsulating IP Security Payload.	6M	CO5	L2
(b)	Analyze in detail about Host-Based Intrusion Detection Systems.	6M	CO5	L2
	(OR)			
10(a)	Outline about SSL Handshake protocol.	6M	CO5	L2
(b)	List various types of virus and its counter measures.	6M	CO5	L1

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M.Tech. (I Semester) Regular Examinations

20VE02-EMBEDDED SYSTEM DESIGN

(VLSI&ES)

Time : 3 hours Max. Marks : 60

Answer one question from each unit

All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Explain the three main characteristics of embedded system that distinguish such systems from other computing systems.	6M	CO1	L2
(b)	Discuss the benefits of using the three different IC technologies in embedded system design.	6M	CO1	L2
	(OR)			
2(a)	Differentiate the controller path and data path with neat schematics.	6M	CO1	L2
(b)	Illustrate with an example FSMD optimization in single purpose processor.	6M	CO1	L2
3(a)	Differentiate the computational model and a language model, and also a textual language and a graphical language.	6M	CO2	L2
(b)	Examine the role of condition variables in synchronization among the processes.	6M	CO2	L2
	(OR)			
4(a)	Summarize the basic operations defined by the concurrent process model on processes.	6M	CO2	L2
(b)	Explain the state machine and sequential program models.	6M	CO2	L2
5(a)	Describe the ARM programmer's model in detail.	6M	CO3	L2
(b)	Demonstrate the ARM's data transfer instructions with an example.	6M	CO3	L3
	(OR)			
6(a)	Explain ARM's control flow instructions with an example.	6M	CO3	L2
(b)	Use the ARM assembly language programming instructions how to add two 64 bit numbers.	6M	CO3	L3
7.	Outline the each block of 3-stage pipeline ARM organization and list out its features.	12M	CO4	L3
	(OR)			
8(a)	Describe the cross-bar switch barrel shifter principle with neat schematics.	6M	CO4	L2
(b)	Discuss the multiply instructions of ARM processor.	6M	CO4	L2
9(a)	Summarize the importance of each step involved in the IC manufacturing process.	6M	CO5	L2
(b)	Explain the CPLD architecture with neat diagram.	6M	CO5	L2
	(OR)			
10(a)	Describe the advantages of emulators over the simulators in IC verification process.	6M	CO5	L2
(b)	Illustrate the new challenges posed by cores to processors providers.	6M	CO5	L3

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M.Tech. (I Semester) Regular Examinations

20VE01-DIGITAL VLSI SYSTEM DESIGN
(VLSI&ES)

Time : 3 hours   Max.Marks : 60

Answer one question from each unit
All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Describe the operation of D and JK Flip flops.	6M	CO1	L1
(b)	Implement BCD to Excess-3 code converter using Mealy state machine.	6M	CO1	L3
	(OR)			
2(a)	Discuss the operation of different kind of tri-state buffers and how the data will be transferred using tri-state devices.	6M	CO1	L2
(b)	Describe the importance of equivalent states in designing sequential circuit and explain how to eliminate them?	6M	CO1	L2
3(a)	Explain about delays in verilog language and describe what is inertial and transport delays.	6M	CO2	L2
(b)	Model the registers and counters using always statement.	6M	CO3	L3
	(OR)			
4(a)	Describe the simulation process with multiple initial or always blocks.	6M	CO2	L2
(b)	Design a 4 bit Adder using structural model and write the verilog code for it.	6M	CO3	L4
5(a)	Construct verilog program to implement traffic light controller.	6M	CO3	L4
(b)	Implement a keypad scanner using verilog programming language.	6M	CO3	L4
	(OR)			
6(a)	Design a simple binary multiplier using verilog.	6M	CO3	L3
(b)	Design and implement BCD to seven segment decoder using verilog.	6M	CO3	L3
7(a)	Discuss about SM charts along with an example's.	6M	CO4	L2
(b)	Summarize the operation of Micro programmed system with single address mode.	6M	CO3	L2
	(OR)			
8(a)	Define SM chart and explain how to convert state graph into an SM chart with an example.	6M	CO4	L2
(b)	What is linked state machine and Design SM chart for serially linked state machines?	6M	CO4	L2
9(a)	Discuss in detail about system functions which are available in verilog.	6M	CO4	L2
(b)	Explain the working of Instruction fetch unit, decode unit and execution unit of MIPS subsystem.	6M	CO4	L2
	(OR)			
10(a)	Define what UDP is and design D flip-flop using UDP.	6M	CO4	L3
(b)	Discuss about the characteristics of RISC Processors and what are advantages of RISC processors over CISC processors.	6M	CO4	L2

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M.Tech. (I Semester) Regular Examinations

20TE06-IC ENGINES AND ALTERNATE FUELS

(TE)

Time : 3 hours Max.Marks : 60

Answer one question from each unit
All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Analyze the phenomenon of auto-ignition. Discuss how auto-ignition is responsible for knocking in S.I Engines.	6M	CO1	L4
(b)	Describe the common-rail fuel injection system with the help of a diagram.	6M	CO2	L2
	(OR)			
2(a)	Describe the energy cell type of combustion chamber with the help of a diagram.	6M	CO1	L2
(b)	Illustrate the heat release rate pattern of a C.I engine during the different stages of combustion.	6M	CO1	L2
3(a)	Demonstrate the working principle of a dual-fuel engine with the help of a schematic diagram.	6M	CO2	L2
(b)	Explain the working principle of stratified charge engines.	6M	CO2	L1
	(OR)			
4(a)	Illustrate the working principle of a variable compression ratio engine with a neat diagram.	6M	CO2	L2
(b)	Describe with the help of a diagram the construction and working principle of a free-piston engine.	6M	CO2	L1
5(a)	Illustrate the working of Three-way catalytic converter with a neat diagram.	6M	CO3	L2
(b)	Demonstrate the working of Selective catalytic reduction (SCR).	6M	CO3	L1
	(OR)			
6(a)	Mention the importance of total emission control packages. Describe with neat sketches two types of total emission control packages.	6M	CO3	L1
(b)	Illustrate the working of Diesel Particulate filter (DPF) with a neat sketch.	6M	CO3	L2
7(a)	Outline the emission characteristics of vegetable fuels.	6M	CO4	L1
(b)	Mention the Advantages and drawbacks with usage of vegetable oils.	6M	CO4	L1
	(OR)			
8(a)	Illustrate the split injection strategy in Biodiesel fuelled engines.	6M	CO4	L2
(b)	What is the effect of compression ratio on the performance of biodiesel fuelled engine?	6M	CO4	L1
9(a)	Explain any one biomass conversion technology with a neat sketch.	6M	CO5	L1
(b)	Distinguish between primary biomass energy sources, secondary biomass sources.	6M	CO5	L2
	(OR)			
10(a)	Distinguish between thermochemical and biochemical processing of Biomass.	6M	CO5	L2
(b)	Discuss the economics and future aspects of biomass.	6M	CO5	L1

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M.Tech. (I Semester) Regular Examinations

20TE03-ADVANCED FLUID MECHANICS

(TE)

Time : 3 hours Max. Marks : 60

Answer one question from each unit

All questions carry equal marks

Q. No.	Questions	Marks	CO	BL
1(a)	Starting from fundamentals derive an expression for Bernoulli's equation from Euler's equation of motion.	6M	CO1	L3
(b)	A flow field is given by $V=x^2y\ i + y^2zj -(2xyz+yz^2)k$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (2,1,3).	6M	CO1	L3
	(OR)			
2(a)	Define Velocity potential function and Stream function and state their properties.	6M	CO1	L1
(b)	A pipe of diameter 400 mm carries water at velocity of 25 m/s. The pressure at the points A and B are given as 29.43 N/cm^2 and 22.563 N/cm^2 respectively while the datum head at A and B are 28 m and 30 m. Find the loss of head between A and B.	6M	CO1	L3
3(a)	Show that for laminar flow through a circular pipe the maximum velocity is twice than that of mean velocity of flow.	6M	CO2	L3
(b)	An oil of viscosity 0.1 N s/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 litres/s. Find the pressure drop in a length of 300 m and also the shear stress at the pipe wall.	6M	CO2	L3
	(OR)			
4(a)	Derive the expression for velocity variation for a flow of viscous fluid between two parallel plates spaced't' distance apart starting from fundamentals. Also sketch the variation.	6M	CO2	L3
(b)	A shaft having a diameter of 50 mm rotates centrally in a journal bearing having a diameter of 50.15 mm and length 100 mm. The angular space between the shaft and the bearing is filled with oil having viscosity of 0.9 poise. Determine the power absorbed in the bearing when the speed of rotation is 60 rpm.	6M	CO2	L3
5(a)	Discuss the following terms related to boundary layer growth when fluid flows past the flat plate (i) Laminar boundary layer, (ii) Laminar sub layer (iii) Boundary layer thickness. Illustrate with the help a sketch.	6M	CO3	L2

(b)	Develop an expression for boundary layer thickness (δ), for the velocity profile for laminar boundary layer flows given as $\frac{u}{U} = 2(\frac{y}{\delta}) - \left(\frac{y}{\delta}\right)^2$.	6M	CO3	L3
	(OR)			
6(a)	Define energy thickness (δ^{**}) and derive an expression for it.	6M	CO3	L3
(b)	Find displacement thickness (δ^*), momentum thickness (θ) and energy thickness (δ^{**}) for the velocity distribution in the boundary layer given by as $\frac{u}{U} = (\frac{y}{\delta})$, where u is the velocity at a distance y from the plate and u=U at y= δ, where δ is boundary layer thickness. Also calculate the value of (δ^*/θ)	6M	CO3	L3
7(a)	Develop Bernoulli's equation for compressible flow when it is undergoing adiabatic process.	6M	CO4	L3
(b)	An aeroplane is flying at a height of 15 km where the temperature is -50^{0}C. The speed of the plane is corresponding to M=2.0. Assuming k=1.4 and R=287 J/kg K. Find the speed of the plane.	6M	CO4	L3
	(OR)			
8(a)	What is Mach cone? Explain the terms Mach angle, Zone of action and Zone of silence by drawing a sketch of Mach cone.	6M	CO4	L2
(b)	A projectile is travelling in air having pressure and temperature as 8.829 N/cm^2 and -2^{0}C. If the Mach angle is 40^0, find the velocity of the projectile. Take k=1.4 and R=287 J/kgK.	6M	CO4	L3
9(a)	What are the different scaling laws applied in microfluidics? Explain any one scaling law.	6M	CO5	L1
(b)	Air flows in an insulated duct with a velocity of 185m/s. temperature and pressure are 11 bar and 285 ^{0}C respectively. Determine (i) temperature and velocity at section of the duct where pressure has dropped to 8 bar due to friction. (ii) the distance between two section if the diameter is 125 mm and friction factor f =0.0035.	6M	CO5	L[illegible]
	(OR)			
10(a)	Write a short note on Micro-Fabrication technology.	6M	CO5	L2
(b)	A gas with a velocity of 300 m/s is flowing through a horizontal pipe at section where pressure is 6 x 10^4 N/m^2 (absolute) and temperature 40^{0}C. The pipe changes in diameter and at this section the pressure is 9 x 10^4 N/m^2. Find the velocity of the gas at this section if the flow of the gas is adiabatic. Take R=287 J/kgK and k=1.4.	6M	CO5	L3

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M.Tech. (I Semester) Regular Examinations

20TE02-ADVANCED HEAT AND MASS TRANSFER

(TE)

Time : 3 hours Max. Marks : 60

Answer one question from each unit
All questions carry equal marks

Note: *Heat and Mass Transfer data book by C.P. Kothandaraman must be supplied in the examination hall.*

Q.No	Questions	Marks	CO	BL
1(a)	Develop a governing equation for temperature distribution and it's solution which is applicable for rectangular fin of uniform cross section stating the assumptions made.	6M	CO1	L1
(b)	A turbine blade made of stainless steel (k=29W/m^{0}C)is 60 mm long, 500mm^2 cross-sectional area and 120 mm perimeter. The temperature of the root of blade is 480^{0}C and it is exposed to products of combustion passing through the turbine at 820^{0}C. If the film coefficient between the blade and the combustion gases is 320 W/m^{20}C, determine (i) The temperature at the middle of the blade; (ii) The rate of heat flow from the blade.	6M	CO2	L3
(OR)				
2(a)	Develop an expression for temperature distribution in the case of a plane wall with uniform heat generation rate when both of its surfaces have the same temperature. Also deduce expression for maximum temperature occurred in the plane wall.	6M	CO1	L3
(b)	A current of 200 amperes is passed through a stainless steel wire(k=20W/m^{0}C), resistivity ρ=70 x 10^{-6} μ cm).If the wire is submerged in liquid at 110^{0}C and the heat transfer coefficient on wire surface is 4000 W/m^{20}C,calculate the centre line temperature of the wire.	6M	CO2	L3
3(a)	Explain the mathematical formulation and method of solving transient heat conduction in a plane wall with finite conduction and convection resistances.	6M	CO2	L2
(b)	A 60mm thick large steel plate(k=42.6 W/m^{0}C, α=0.043m^2/h), initially at 440^{0}C is suddenly exposed both sides to an environment with convective heat transfer coefficient 235 W/m^{20}C and temperature 50^{0}C. Determine the centre line temperature, and temperature inside the plate 15mm from the midplane after 4.3 minutes.	6M	CO2	L3
(OR)				
4.	Develop an expression for temperature distribution in the case of two dimensional steady state heat conduction in rectangular plate of length L and Height H in x and y directions respectively by the method of separation of variables.	12M	CO3	L3
5(a)	If the velocity distribution in laminar boundary layer over a flat plate is assumed to be given by the second order polynomial u = a + by + cy^2, determine its form using the necessary boundary conditions.	6M	CO3	L2

(b)	A copper bus bar 25 mm diameter is cooled by air (in cross flow) at 30^{0}C and flowing past the bus bar with a velocity of 2.5 m/s. If the surface temperature of the bar is not to exceed 85^{0}C and resistivity of copper is 0.0175 x 10^{-6} ohm-m^3/m, calculate the following: (i) the heat transfer coefficient from the surface to the air; (ii) The permissible current intensity for the bus bar. The following empirical correlations may be applicable for a single cylinder placed in cross flow. For 10<Re<10^3 Nu=0.44$Re^{0.5}$; For 10^3<Re< 2 x 10^5 Nu=0.22 $Re^{0.6}$The thermo-physical properties are evaluated at t_∞=30^{0}C and are given as k =0.02673 W/m^{0}C; v=16 x 10^{-6} m^2/s	6M	CO3	L3
	(OR)			
6(a)	A horizontal heated plate measuring 1.5 m x 1.1m and is at 215^{0}C, facing upwards, is placed in still at 25^{0}C. Calculate the heat loss by natural convection.	6M	CO3	L3
(b)	Air at 20^{0}C and 1 atmosphere is forced through a 25 mm diameter tube 400 mm long, at an average velocity of 0.33 m/s. Calculate the rate of heat transfer if the tube wall is maintained at 180^{0}C.	6M	CO3	L3
7(a)	Discuss the assumptions made in Nusselt's theory of condensation on a vertical plate.	6M	CO4	L2
(b)	Water is boiled at the rate of 25kg/h in polished copper pan, 280 mm in diameter, at atmospheric pressure. Assuming nucleate boiling conditions, calculate the temperature of the bottom surface of the pan.	6M	CO4	L2
	(OR)			
8(a)	Explain the following laws of radiation (i) Wein's displacement law (ii) Lambert's cosine law (ii) Planck's distribution law.	6M	CO4	L2
(b)	Two concentric spheres 210 mm and 300 mm diameters with the space between them evacuated are to be used to store liquid air (-153^{0}C) in a room at 27^{0}C. The surfaces of the spheres are flushed with aluminium(ε=0.03)and latent heat of vaporization of liquid air is 209.35 kJ/kg. Calculate the rate of evaporation of liquid air.	6M	CO4	L3
9(a)	State and explain the Fick's law of mass diffusion with the help of a simplified sketch.	6M	CO5	L2
(b)	A vessel contains a binary mixture of O_2 and N_2 with partial pressures in the ratio 0.21 and 0.79 at 15^{0}C. The total pressure of the mixture is 1.1 bar. Calculate the following (i) Molar concentrations (ii) Mass densities (iii) Mass fractions and (iv) Molar fractions of each species.	6M	CO5	L3
	(OR)			
10.	Derive the basic differential equations for equi molar counter diffusion in a binary isothermal ideal gas mixture and express the mass flux of species A in terms of partial pressures.	12M	CO5	L3

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M.Tech. (I Semester) Regular/Supplementary Examinations

20TE01-ADVANCED THERMODYNAMICS

(TE)

Time : 3 hours Max.Marks:60

Answer one question from each unit

All questions carry equal marks

Q.No	Questions	Marks	CO	BL
1(a)	Formulate the Maxwell relations and explain its significance.	6M	CO1	L2
(b)	Describe Helmholtz energ'y equation of state and partial derivatives in the single-phase region.	6M	CO1	L2
	(OR)			
2(a)	List out the limitations of first law of thermodynamics and also explain the PMM1.	6M	CO1	L2
(b)	Establish the Clausius-Clapeyron equation.	6M	CO1	L2
3(a)	Derive the Vander Waal's equation.	6M	CO2	L2
(b)	A gaseous mixture consists of 1 kg of oxygen and 2 kg of nitrogen at a pressure of 150 Kpa and a temperature of 20^{0}C. Determine the changes in internal energy, enthalpy and entropy of the mixture when the mixture is heated to a temperature of 100^{0}C at constant volume.	6M	CO2	L3
	(OR)			
4(a)	Derive the equation of state for Ideal gas.	6M	CO2	L2
(b)	Explain about the classical theory of specific heat capacity.	6M	CO2	L2
5(a)	Show that for an ideal gas, the slope of the constant volume line on the T-S diagram is more than that of constant pressure line.	6M	CO3	L2
(b)	Explain the relationship between activity and activity coefficient in real liquid mixtures.	6M	CO3	L2
	(OR)			
6(a)	Develop the expressions for change in internal energy and enthalpy of non-reactive mixtures.	6M	CO3	L2
(b)	Determine the enthalpy of combustion of liquid octane (C_4H_{10}) with 100% theoretical dry air. Both products and reactants are at 0.5 atm and 306K.	6M	CO3	L3
7(a)	Deduce the availability equation for non – flow process.	6M	CO4	L2
(b)	A hot flue gas expands in a gas turbine from 793 K/500 kPa to 573 K/100 kPa. Though the turbine is well insulated, there is a steady heat loss of 10 kJ to the surroundings (98 kPa /293 K) per kg of flue gas expanding. Determine on a unit mass basis of flue gas (i) decrease in availability (ii) maximum work availability (iii) Irreversibility.	6M	CO4	L3
	(OR)			
8(a)	Deduce the expression of Irreversibility for open and closed systems.	6M	CO4	L2
(b)	Air enters an adiabatic compressor in steady flow at 140 kPa, 17 ^{0}C and 70 m/s and leaves it at 350 kPa, 127 ^{0}C and 110 m/s. The environment is at 100 kPa, 7 ^{0}C. Calculate per kg of air (i) the actual amount of work required (ii) the minimum work required (iii) the irreversibility of the process.	6M	CO4	L3
9(a)	Describe the working of actual vapor power cycle process.	6M	CO5	L2
(b)	Derive the expression for second law analysis of gas power cycles.	6M	CO5	L2
	(OR)			
10(a)	Explain about Atkinson cycle process and list out its wide applications.	6M	CO5	L2
(b)	Illustrate the working of combined gas vapor cycles.	6M	CO5	L2

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