Registration No.:

Integrated Dual Degree (B.Tech and M.Tech)
RME4G004/ REC4G002/ RME4G003/ RPL4G003/ RMN4G003/
RML4G003/ RMM4G003/ RMF4G003/ RAU4G003/ RAE4G003

4ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: Data Structure
BRANCH(S): MECH, ECE, ETC, ME, ECE, PLASTIC, MINING, MINERAL, METTA, MME, MANUTECH, AUTO, AERO
Time: 3 Hour
Max Marks: 100
Q.Code: P163
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**
a) Explain abstract data types (ADT) with suitable examples.
b) Write the limitations of array implementation of simple queue. How it can be avoided?
c) List out some advantages and disadvantages of linked list over array data structure.
d) Consider a linear queue implemented using 1-D array. Initially the value of FRONT and REAR is initialized to -1. Perform suitable insertions and deletions so that you can get the following FRONT and REAR values.
  I) FRONT = 3 and REAR = 9.
  II) FRONT = 4, REAR = 4.
 Demonstrate each operation through the queue with suitable diagrams.
e) Define a complete binary tree and strictly binary tree with suitable example.
f) Write the limitations of array implementation of simple queue. How it can be avoided?
g) Differentiate between strongly connected graph and weakly connected graph.
h) Explain with suitable example how a graph can be represented using an array in computer's memory.
i) Differentiate between linear probing and quadratic probing technique to resolve collision in hashing.
j) Sort the given elements in ascending order using bubble sort, showing each pass.
 2, 1, 4, 0, 7, 3

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**
a) Discuss the algorithm for insertion, deletion, and display operation in a circular queue.
b) Develop a C-function to merge two single lists having the following elements. Start holds the address of first node of List 1 and head holds the address of first node of List 2.
  List 1: 10 → 15 → 22 → 46 → 17 → 39
  List 2: 23 → 12 → 42 → 36 → 41

c) Construct an AVL tree from the list of given elements:
  55, 66, 77, 15, 11, 33, 22, 35, 25, 44, 88.

d) Discuss height and depth of a binary tree. Construct a binary search tree from these numbers: 90, 36, 58, 96, 32, 92, 12, 93, 24, 97, 38, 60, and 98

e) Discuss the data structures used for Depth First Search (DFS) and Breadth First Search (BFS) algorithm in a Graph. Construct the spanning tree using the Depth First Search for the following graph, starting from node B.
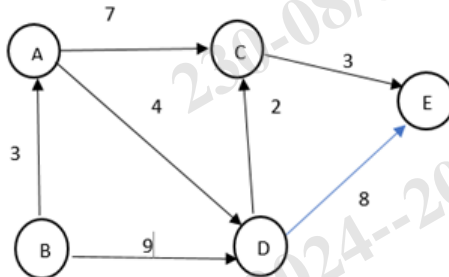
f) Define path matrix. Represent the following graph in memory using array and linked list representation.
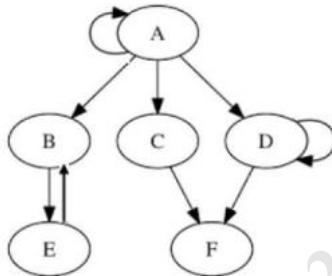
g) List out the properties of Max-Heap and Min-Heap. Sort the following list of numbers in descending order using Heap sort.

  77, 85, 5, 7, 10, 72, 50, 21

h) Let A is the array of the following elements A = {2, 4, 6, 8, 9, 10, 12, 13}. Search the element 12 using binary search technique. Write its time complexity.

i) Discuss the advantage and average efficiency of quick sort. Apply Quick sort on the following data and show the contents of the array every pass:
  48, 7, 26, 4, 13, 23, 98, 57, 10, 5, 32

j) From the following inorder and postorder traversal, Construct the binary tree and show the steps of tree construction.

  Postorder: 12, 30, 40, 37, 25, 60, 70, 62, 87, 75, 50

  Inorder: 12, 25, 30, 37, 40, 50, 60, 62, 70, 75, 87

k) Consider the following sequence of operations on an empty queue.
  Enqueue (21); enqueue (24); dequeue (); enqueue (28); enqueue (32); q = dequeue ();
  then compute the value of q? Find the position of front and rear by assuming the queue as both linear and circular.

l) Given N set of integers. Write a program in C to arrange them in descending order using insertion sort techniques.

Part-III

**Only Long Answer Type Questions (Answer Any Two out of Four)**

Q3 **a)** Use linked list to represent the following polynomial P (x, y, z) = $2xy^2z^3 + 3x^2yz^2 + 4xy^3z + 5x2y^2 + 8xy^2z^5 + 19$ **(4x4)**

b) Describe the data structure used to represent a general tree.

c) Define circular queue. Sketch to explain the placement of FORNT and REAR pointers when Queue is Full and Queue Containing single element.

d) Convert the following infix expression to post fix expression using STACK

$$C – D + (E – F) + F/(H + W)*A$$

Q4 Discuss the concept of collision in Hashing technique. List out different collision resolution   **(16)**
techniques. Consider a list of size 20 (m = 20). Insert the following list of keys given below into the Hash table and resolve collision using Linear Probing, quadratic probing, and rehashing method by taking the hash function key % 10.

96, 48, 63, 29, 87, 77, 48, 66, 69, 93, 61

Q5 **a)** What do you mean by graph traversal? What are the data structures used for graph   **(8)**
traversal? Write the algorithm for BFS and Perform the Breadth First Search of the graph given below where M is the starting node.
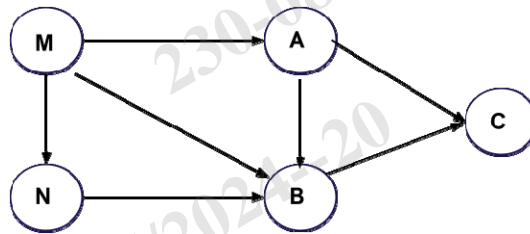
b) Write the algorithm of merge sort and explain the working of merge sort with a suitable   **(8)**
example.

Q6 **a)** Discuss height and depth of a binary tree. Construct a binary search tree from these   **(8)**
numbers: 90, 36, 58, 96, 32, 92, 12, 93, 24, 97, 38, 60, and 98. Delete the root node from this tree.

b) Sort the following array of elements using selection sort.   **(8)**
96, 48, 63, 29, 87, 77, 48, 66, 69, 93, 61

Registration No.:

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Digital Systems Design
BRANCH(S): ECE,ELECTRONICS & CE,ETC,MECH,MMEAM,AEIE,EIE
Time: 3 Hour
Max Marks: 100
Q.Code: P313
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**
a)	Convert $(5064)_9$ into base 5.	
b)	Show that A+B. C = (A+B).(A+C)	
c)	What is the importance of parity bit?	
d)	State the need for a tristate buffer.	
e)	How race condition in JK flipflop can be resolved?	
f)	Differentiate between level clocking and edge triggering.	
g)	List the advantages of CMOS.	
h)	What problem could occur when the counter circuit is powered-up?	
i)	Write any three differences between EEPROM and UVEPROM.	
j)	Define access time and word length of a memory chip.	

Part-II

|		
Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**
a)	Perform the arithmetic operation $(+42) + (–13)$ and $(–42) – (–13)$ in binary using the signed 2's-complement representation for negative numbers.	
b)	Consider a 4-input Boolean function that outputs a binary 1 whenever an odd number of its inputs are binary 1.Using Boolean logic or otherwise, show how the above function can be implemented using only 2-input XOR gates.	
c)	How parity checkers help in finding errors in digital data transmission?	
d)	What is associative memory? Draw and explain its block diagram.	
e)	Find the POS for the function $F(x, y, z) = \pi (0, 1, 4, 5)$.	
f)	Design a BCD to decimal decoder.	
g)	Design a 5 x 32 decoder with four 3 x 8 decoder with enable and one 2 x 4 decoder. Use block diagrams only.	

h) A sequential circuit with 2 JK Flip Flops A and B, two inputs X and Y, and one output Z. The Flip Flop input equations and circuit output equations are

$J_A = B'Y'+BX$, $K_A = B'XY'$, $J_B = A'X$, $K_B = A+XY'$ and $Z = AX'Y'+ BX'Y$

Draw the logic diagram of the circuit with the state table.

i) With the aid of block and example state diagrams, describe the main features of Moore and Mealy implementations of finite state machines.

j) What is asynchronous counter? Design asynchronous counter that counts the sequence of 0-1-4-6-7 using T flip-flop.

k) Explain the working of R-2R ladder type DAC.

l) Implement a 4:1 MUX circuit using VHDL.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Prove that a positive-logic AND gate is a negative-logic OR gate and vice-versa. **(4)**

b) Apriority encoder has 2N inputs. It produces an N-bit binary output indicating the most significant bit of the input that is TRUE, or 0 if none of the inputs is TRUE. It also produces an output NONE that is TRUE if none of the inputs is TRUE. **(12)**
   (i) Write down the Truth table showing all inputs and all outputs for an eight-input priority encoder.
   (ii) Give simplified Boolean expressions for all outputs of the eight-input priority encoder.

Q4 **a)** Design a combinational circuit with three inputs and six outputs. The output binary number should be the square of the input binary number. **(8)**

b) Draw a neat diagram of TTL NAND gate and explain its operation. What is meant by sourcing and sinking? **(8)**

Q5 **a)** Draw the block diagram of a 4 bit ALU, and explain it, showing its inputs and outputs. **(6)**

b) **(10)**
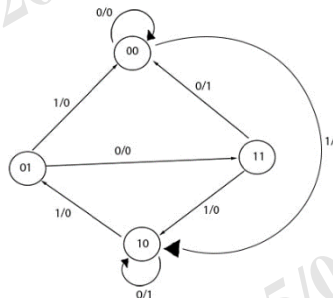
Design the sequential circuit with respect to the above state diagram using J-K flip flops.

Q6 **a)** Implement the circuit of a PLA with 3 input, 2 output, and 4 product terms **(8)**
$F_1(A, B, C) = \sum (3,5,6,7)$, $F_2(A, B, C) = \sum (0,2,4)$

b) What is the difference between a serial and a parallel transfer? Explain how to convert serial data to parallel and parallel data to serial. What type of register is needed? **(8)**

Registration No.: [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Total Number of Pages: 02
Course: Integrated Dual Degree (B.Tech and M.Tech)
Sub_Code: REL4D001/ REE4D001/ REC4C001

4ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: Electro Magnetic Theory
BRANCH(S): ELECTRICAL, EEE, ECE, ETC
Time: 3 Hour
Max Marks: 100
Q.Code: P090
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**
   a) $D = (x + z) a_y$. Transform the vector to cylindrical and spherical coordinates.
   b) State and prove divergence theorem.
   c) State Gauss law and its application.
   d) The finite sheet $0 \le x \le 1$, $0 \le y \le 1$ on the $z = 0$ plane has a charge density $\rho_s = xy(x^2 + y^2 + 25)^{3/2}$ nC/m². Find the total charge on the sheet.
   e) Define a dielectric material and under what conditions it will be linear, homogeneous and isotropic.
   f) What is equipotential surface and what is its use.
   g) State Ampere circuit law. Using stoke theorem derive maxwell's third equation.
   h) What are the boundary conditions that H or B must satisfy at the interface between two different media.
   i) What is meant by skin effect? Mention its significance.
   j) Describe in brief how an antenna radiates?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**
   a) Define a vector. Given vectors $A = 3a_x + 4a_y + a_z$ and $B = 2a_y – 5a_z$. Find the angle between A and B.
   b) Three field quantities are given by $P = 2a_x – a_z$, $Q = 2a_x – a_y + 2a_z$, $R = 2a_x – 3a_y + a_z$. Determine
      (I) $(P + Q) \times (P – Q)$
      (II) $Q.R \times P$
      (III) The component of P along Q.
   c) Define coulomb's law. Derive the force and electric field intensity on a point charge Q_2 due to the point charge Q_1.
   d) Briefly explain any two applications of Gauss law.
   e) Find the resistance of a spherical capacitor having inner radius 'a' and outer radius 'b', filled with a lossy dielectric having material parameters σ and ε.

f) A coaxial cable contains an insulating material of conductivity σ. If the radius of the central wire is 'a' and that of the sheath is 'b'. Show that the conductance of the cable per unit length is G = $2\pi\sigma$/ ln(b/a) .

g) State and explain Poynting theorem.

h) Write Maxwell's Equations in Integral Form. Given the magnetic vector potential A = $\rho^2/4a_z$ Wb/m. Calculate the total magnetic flux crossing the surface $\phi = \pi/2$, $1 \le \rho \le 2m$, $0 \le z \le 5$.

i) If a transmission line of characteristic impedance 50 Ω is terminated in complex impedance 25 + j100 Ω, what will be the reflection coefficient and the VSWR of the line?

j) Suppose the input impedance to a line is Z_{in} = (20 – j40)Ω and the load impedance is Z_L = (20 + j40)Ω. If the line has a characteristic resistance R_C = 100Ω and velocity of propagation of u = 250 m/μs and is operated at a frequency of 30 MHz, determine the length of the line using Smith chart.

k) A center-fed dipole antenna with a *z*-directed current has electrical length L/λ $<<$ 1/30.
(*a*) Show that the current distribution may be assumed to be triangular in form.
(*b*) Find the components of the vector magnetic potential **A**.

l) Determine the gain, beam width and capture area for a parabolic reflector antenna with 10 m diameter dish and dipole feed at 10GHz.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Given point P(–2, 6, 3) and vector A = yax+ (x + z) ay, express P and A in cylindrical and spherical coordinates. Evaluate A at P in the Cartesian, cylindrical, and spherical systems. Express the vector B = (10/r)a_r + rcosθa_θ + a_ϕ in Cartesian and cylindrical coordinates. **(16)**

Q4 Describe the electric and magnetic boundary conditions in various interfaces. **(16)**

Q5 Derive the parameters related to the wave propagation in lossy and lossless dielectrics. How the polarization of a TEM wave is obtained? **(16)**

Q6 A 250 MHz 40 V peak signal is incident on a 72 Ω transmission line. The velocity factor for this line is 0.91. The line is 250m long and is terminated in a 200 Ω load. **(16)**
(a) Find the wavelength of the signal on line.
(b) What is the length of the line in wavelength?
(c) What is the SWR for this situation?
(d) Find the reflection coefficient.
(e) Calculate the peak value of reflected voltage.
(f) What percent of incident power is returned as reflected power?
(g) Find the peak values of incident and reflected currents and peak values of the currents at nodes and antinodes.
(h) Determine the peak values of the voltage standing wave at voltage nodes and antinodes.

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Kinematics & Dynamics of Machines
BRANCH(S): MECH,MMEAM,ME,AUTO
Time: 3 Hour
Max Marks: 100
Q.Code: P061
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** (2 x 10)
a) Explain the term i)Lower pair ii) Kinematic Chain.
b) What are the methods for determining the velocity of a point on a link?
c) What are the advantages of gear drive?
d) Define i) Circular Pitch ii) Diametral pitch.
e) What do you understand by 'gear train'? Discuss the various types of gear trains.
f) Define inertia force and inertia torque.
g) Explain Angle of friction.
h) Define creep of the belt.
i) Explain what you understand by 'initial tension in a belt'.
j) Write down the difference between self energizing brake and self locking brake.

Part-II

**Q2** **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 × 8)
a) Sketch and Describe crank and slotted quick return motion mechanism. Derive an expression for the ratio of times taken in forward and return stroke.
b) Obtain an expression for the length of a belt in an open belt drive.
c) Write short note on Equivalent Dynamical System.
d) It is stated that the speed at which a belt or rope should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt or rope at that speed. Prove the statement.
e) Describe the construction and operation of a rope brake absorption dynamometer.
f) Determine the retardation of the vehicle when the braking is applied to rear wheels of a four wheeled moving vehicle.
g) Derive an expression for the minimum number of teeth required on the pinion in order to avoidinterference in involute gear teeth when it meshes with wheel.
h) In a screw jack, the helix angle of thread is αand the angle of friction is Ø. Show that its efficiency ismaximum, when $2\alpha = (90º – Ø)$.
i) How the velocity ratio of epicyclic gear train is obtained by tabular method?

j) Derive an expression for the inertia force due to reciprocating mass in reciprocating engine, neglecting the mass of the connecting rod.

k) Explain any one inversion of Four bar Chain.

l) Derive an expression for the friction moment for a flat collar bearing in terms of the inner radius r_1, outer radius r_2, axial thrust W and coefficient of friction μ. Assume uniform intensity of pressure.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 How are velocity and acceleration of the slider of a single slider crank chain determined analytically? In a slider crank mechanism, the length of the crank and connecting rod are 150 mm and 600 mm respectively. The crank position is 60° from inner dead centre. The crank shaft speed is 450 r.p.m. (clockwise). Using analytical method, determine Velocity and acceleration of the slider. **(16)**

Q4 Below figure shows diagrammatically a compound epicyclic gear train. Wheels A, D, and E are free to rotate independently on spindle O, while B and C are compound and rotate together on spindle P, on the end of arm OP. All the teeth on different wheels have the same module. A has 12 teeth, B has 30 teeth and C has 14 teeth cut externally. Find the number of teeth on wheels D and E which are cut internally. If the wheel A is driven clockwise at 1 r.p.s. while D is driven counter clockwise at 5 r.p.s., determine the magnitude and direction of the angular velocities of arm OP and wheel E. **(16)**
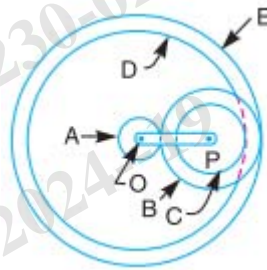
Q5 Describe with the help of a neat sketch the principles of operation of an internal expanding shoe. Derive the expression for the braking torque. **(16)**

Q6 a) A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 r.p.m. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 MPa, density of leather 1 Mg/m^3 and thickness of belt 10 mm, determine the width of the belt taking centrifugal tension into account. **(8)**

b) A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m.. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. **(8)**

Registration No :

Total Number of Pages : 02

B.Tech/ Integrated Dual Degree
RCS4C003

4th Semester Reg/Back Examination: 2023-24
Computer Organization and Architecture
CSE, CSEAI, CSEAIME, CSEDS,CST, IT
Time : 3 Hour
Max Marks : 100
Q. Code : P394
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: **(2 x 10)**

   a)   Mention the difference between Computer Organization and Computer Architecture
   b)   Mention the difference between big-endian and little-endian representations.
   c)   What is an instruction format? Explain the fields in the instruction format.
   d)   Represent +(1.7) using IEEE 754 single precision and double precision format.
   e)   Explain the difference between main memory and control memory.
   f)   Enlist the types of registers used in a microprocessor.
   g)   Define the following terms: *memory access time, memory cycle time.*
   h)   List out the disadvantages of DRAM over SRAM.
   i)   Define instruction stream and data stream. Give an example of SISD computer system.
   j)   Define an interrupt. Differentiate between software and hardware interrupts.

Part-II

**Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of   (6 × 8)
          Twelve)**

   a)   Discuss the instruction execution cycle elaborating about different types of registers used
   b)   Design a 4-bit carry look ahead adder with clear expressions for Propagate and Generate functions. Also draw the circuit diagram.
   c)   Briefly explain the two hardware methods to establish priority.
   d)   Compute the number of cycles required to execute 100 tasks in a 5 stage pipeline system. Derive the speed-up ratio and determine the time required to execute the same 100 tasks in a non-pipeline processor.
   e)   A block set-associative cache consists of 64 blocks divided into 4 block-sets. The main memory contains 4096 blocks, each consisting of 128 words. How many bits are there in a main memory address? How many bits are there in each of the TAG,SET and WORD fields?

   f)   Perform the division of 10 by 7 by using restoration method.
   g)   Explain about the micro-sequencer unit with a neat diagram.

h) Write the following expression using three-address, two address and one-address format: A+B/(D*E)-F

i) Explain about the virtual memory concept. Why is it required? Explain about the page table and the TLB.

j) What is RTL? Describe various methods of RTL. List the basic symbols and its use in RTL.

k) An instruction is stored at location 300 with its address field at location 301.The address field has the value 400. A processor register R1 contains the no 200. Evaluate the Effective Address if the addressing mode of the instruction is :
i) Direct
ii) Immediate
iii) Relative
iv) register Indirect
v) Index with R1 as the Index Register

l) The memory unit of a computer has 512K words of 32 bits each. The computer has an instruction format with four fields: an operation code field, a mode field to specify one of the eight addressing modes, a register address field to specify one of the 70 processor registers and a memory address. Specify the instruction format and the number of bits in each field.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What do you mean by an addressing mode? Explain the importance of different addressing modes in computer architecture with an example from each. **(16)**

Q4 Explain Booth's algorithm with the help of a flowchart. Multiply $(-3)_{10}$ with $(8)_{10}$ using Booth's algorithm. Highlight the demerits of Booth's algorithm for which modified Booth's algorithm is used. **(16)**

Q5 What is the importance of Direct Memory Access? Explain the working of DMA Controller with a neat diagram. **(16)**

Q6 What is pipelining? What are the hazards that are encountered in a pipeline system? Given below the code, identify the hazards and explain the solution to those: **(16)**

```
ADD   R1,R2,R3
SUB   R2,R4,R6
XOR   R3,R1,R2
OR    R3,R4,R5
```

Registration No.:

Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)
Sub_Code: RCI4D002

4ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: CONCRETE TECHNOLOGY
BRANCH(S): CIVIL,CE
Time: 3 Hour
Max Marks: 100
Q.Code: P539
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**
a)	What is the function of alumina in cement?	
b)	What do you mean by bulking of sand?	
c)	State the fineness modulus values for fine sand, medium sand, and coarse sand.	
d)	What are the various factors which affect the workability of concrete?	
e)	Curing period of PPC concrete is more or OPC concrete is more? Explain.	
f)	State three properties of hardened concrete.	
g)	Distinguish between creep of concrete and shrinkage of concrete.	
h)	What are the various non destructive testing methods used for concrete members?	
i)	Which IS Code is used for mix design of concrete?	
j)	State an example of light weight aggregate. What is its application?	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**
a)	Describe the chemical composition of Portland cement. Distinguish between initial setting time and final setting time of cement.	
b)	Explain: soundness of aggregate and gap graded aggregate.	
c)	Distinguish between segregation and bleeding of concrete.	
d)	How the compressive strength of concrete is determined experimentally?	
e)	What special care should be considered during concrete manufacture for ensuring good quality mixing water?	
f)	Explain various curing methods adopted and duration of curing for getting desired strength of concrete.	
g)	Explain the difference between modulus of elasticity of concrete and dynamic modulus of elasticity of concrete.	
h)	Explain the various factors which influence the creep of concrete.	
i)	Explain any two parameters which affect the durability of concrete.	

j) Describe the characteristics of high performance concrete.

k) Distinguish between conventional cement concrete and light weight concrete. State the major applications of light weight concrete.

l) Describe the constituents, advantages, and applications of polymer concrete.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Define admixture. What is the purpose of using admixtures in concrete? Distinguish among accelerating admixtures, retarding admixtures, and air entraining admixtures. **(16)**

Q4 State the essential properties of fresh concrete and hardened concrete. Explain any one laboratory method to assess the workability of concrete. **(16)**

Q5 Explain the procedure to find the tensile strength of concrete. **(16)**
Explain the effects of creep and various factors which influence the creep of concrete.

Q6 What do you mean by mix design? Explain BIS method of mix design preparation of concrete. **(16)**

4ᵗʰ Semester Reg/Back Examination: 2023-24
Design and Analysis of Algorithm
CSE, IT, CSEAI, CSEAIME, CSEDS, CST, ELECTRICAL & C.E, ELECTRONICS & C.E

Time : 3 Hour
Max Marks : 100
Q. Code : P587
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: (2 x 10)
a) What is the running time of Quick sort when all elements of array **A** have the same value?
b) The elements 61, 18, 25, 30, 90, 20 are inserted one by one in the given order into a Max Heap. The resultant Max Heap is …………
c) Arrange the following functions in the increasing order of their growth.
$\ln 2^n$, $n^{1.001}$, $n \log n$, e^n, n^{10}
d) Give an asymptotic upper bound for the recurrence $T(n) = T(n-1) + n$.
e) Why greedy algorithm cannot be applied to solve 0-1 knapsack problem?
f) Formulate Longest Common Subsequence (LCS) as a dynamic programming.
g) Write the recurrence equation to represent the time complexity of merge sort and solve it using Master method.
h) What do you mean by heuristic approach?
i) Define Max Clique problem.
j) What is the difference between decision problem and optimization problem? Give an example of optimization problem and write its equivalent decision problem.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of   (6 × 8)
Twelve)

a) Solve the following recurrence equation: $T(n) = 5T(n/5) + \sqrt{n}$, $T(1) = 1$, $T(0) = 0$.

b) Consider two strings A = "qpqrr" and B = "pqprqrp". Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B. Then compute the value of $x + 10y$. Adopt dynamic programming to find the longest common subsequence.

c) Let A1, A2, A3, and A4 be four matrices of dimensions 10 x 5, 5 x 20, 20 x 10, and 10 x 5, respectively. Calculate the minimum number of scalar multiplications required to find the product A1A2A3A4 using the basic matrix multiplication method. **Note** : Use dynamic programming for optimal parenthesization.

d) A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

| character	a	b	c	d	e	f
Frequency	5	9	12	13	16	45

Note : Each character in input message takes 1 byte.

If the compression technique used is Huffman Coding, how many bits will be saved in the message?

e) Give asymptotic upper bounds for T(n) in each of the following recurrences. Assume that T(n) is constant for sufficiently small n.

(i) $T(n) = T(n/2) + T(n/4) + T(n/8) + n$ (ii) $T(n) = 3T(n/4) + n^2$

f) Apply Breadth First Search and Depth First Search algorithm to find all possible order of visiting the nodes of the following graph by taking M as the source vertex.
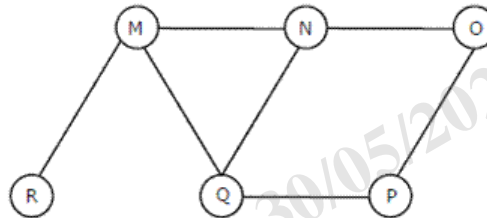
Let G be a graph with n vertices and m edges. What is the tightest upper bound on the running time on Breadth First Search and Depth First Search of G? Assume that the graph is represented using adjacency matrix.

g) Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source. In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized? Show all steps.
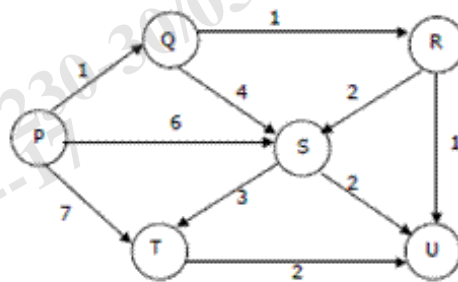

h) Write the steps of solving a recurrence equation using the master method. Can the master method be applied to the recurrence $T(n) = 4T(n/2) + n^2 \log n$? Why or why not? Give an asymptotic upper bound for this recurrence.

i) Apply dynamic programming technique in solving the travelling salesman problem.

j) Write the solution of n-queen problem using the branch-and- bound technique.

k) What do you mean by randomization? Write randomized quick sort algorithm and compare it with quick sort algorithm.

**l)** Assume 3-SAT problem as an NP-complete problem, reduce Node cover decision problem to 3-SAT problem.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a** Using recurrence tree method, argue that the solution to the recurrence relation $T(n) = T(n/3) + T(2n/3) + cn$, where $c > 0$, is $\Omega(n \log n)$. **(8+8)**

b Show that the solution to $T(n)=2T(n/2)+n$ is $O(n \log n)$ using substitution method.

Q4 Write the general steps of dynamic-programming paradigm to solve a problem. **(4+4+4+4)** How is it different from the divide and conquer approach? Write pseudo code for dynamic-programming algorithm to solve 0-1 knapsack problem. What is the complexity of your algorithm?

Q5 What is a spanning tree? Write the pseudo code for finding the minimum **(2+6+2+6)** spanning tree of a given graph using Prim's algorithm. Derive the time complexity of the algorithm. Use the algorithm to find the minimum spanning tree of the following graph.
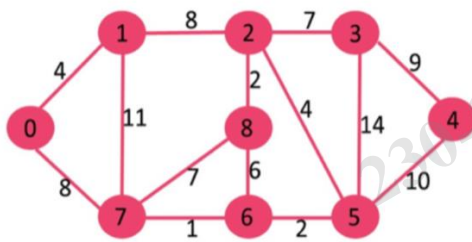
Q6 **a** Discuss the P, NP, NP-Hard and NP-Complete class of problems with suitable **(8+8)** examples.

b Define the node cover problem. Discuss a 2-approximation algorithm for node cover problem on the following graph.
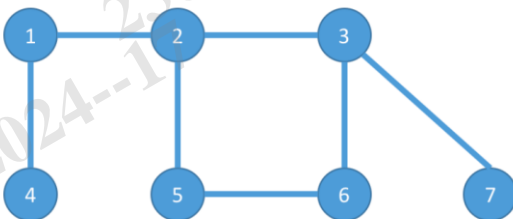
Total Number of Pages : 02　　　　**Course: Integrated Dual Degree (B.Tech and M.Tech)**
　　　　　　　　　　　　　　　　　　　　　　　Sub_Code: REL4C001/ REE4C001/RBM4C001

4th Semester Regular/Back Examination: 2023-24
SUBJECT: DIGITAL ELECTRONICS
BRANCH(S): ELECTRICAL, EE, EEE, BIOMED
Time : 3 Hour
Max Marks : 100
Q.Code: P056
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1　　**Answer the following questions :**　　　　　　　　　　　　　　　　　　　**(2 x 10)**
　　a)　Find out the hexadecimal equivalent of $(707.77)_8$.
　　b)　Write down any two applications of EX-OR gate.
　　c)　What will be a $\oplus$ b, If ab = 0?
　　d)　How many 3 to 8 line decoders with an enable input are needed to construct a 6 to 64 line decoder without using any other logic gates?
　　e)　Write the difference between synchronous inputs and asynchronous inputs.
　　f)　The output of a J-K flip-flop is 0. Its output does not change when a clock pulse is applied. What can be the inputs J and K respectively?
　　g)　What is ALU?
　　h)　Differentiate between PLA & PAL.
　　i)　What is sequential circuit? Also draw a 1-bit memory circuit.
　　j)　What is FPGA?

Part-II

Q2　　**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**　　**(6 × 8)**
　　**a)**　Implement EX-OR gate using minimum number of NAND gates.
　　b)　Obtain the simplified form for the given maxterm expression using K-map.
　　$f(A,B,C,D) = \prod(0,1,4,5,6,7,9,14) \cdot d(13,15)$
　　c)　Implement the given functions using single 3:8 decoder.
　　$f_1(A,B,C) = \prod(2,3,4,5,7)$
　　$f_2(A,B,C) = \sum(1,3,5)$
　　d)　Illustrate CCD memory and write its few applications.
　　e)　Explain any one of the error detecting & error correcting coding scheme.
　　f)　Explain Mod-5 ripple counter using JK-FF with its output wave forms.
　　g)　Explain operation of 4-bit SIPO with necessary diagram.
　　h)　Write down the specifications for D/A converter and also explain it.

i) Design a magnitude comparator to compare two 3-bit binary numbers.

j) Give an example of A/D converter and mention its few important characteristics.

k) Design S-R flip-flop to D flip-flop conversion. Find the conversion table.

l) Explain the operation of TTL with required diagram.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Simplify the given function using K-map. Also find its POS result.   (8+8)
$$f(A,B,C) = \sum m(0,2,4,6,7,8,10,12,13,15)$$

b) Find the Boolean function implemented in the figure using 4:1 MUX.
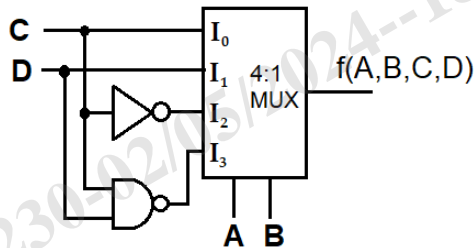
Q4 a) Design a BCD adder with proper explanation.   (8+8)

b) Discuss the working of CMOS circuit as a digital logic operation.

Q5   Design a decade counter using T-FF. Also draw its waveforms.   (16)

Q6 a) Explain the design principle of ROM. Mention its differences than RAM.   (8+8)

b) Explain A/D converter using voltage-to-frequency conversion with proper circuit and waveforms.

B.Tech/ & IDD(B.Tech and M.Tech)
REL4G001, RCS4G002, REL4G001, RCS4G002,
REE4G001, RIT4G002, REC5C001

4th/6th Semester Regular/Back Examination: 2023-24
DIGITAL SIGNAL PROCESSING
EE, CSE, CSEAI, CSEAIME, CSEDS,CST, CSE, EEE, CSE,IT, BIOTECH
Time: 3 Hour
Max Marks: 100
Q.Code : P166
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**

     a)   Describe Energy and Power signal with an example.

     b)   What is BIBO in reference to stability of a system ?

     c)   What is zero padding? What are it's applications?

     d)   What do you mean by 'twiddle factor' of DFT & show how it is cyclic?

     e)   What is frequency pre-warping effect?

     f)   State the Time Reversal Property in DFT.

     g)   In an N-point FFT, how many complex additions are required?

     h)   What is the reason that FIR filter is always stable?

     i)   State the characteristics of Adaptive Signal Processing.

     j)   What do you mean by mean square error?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**

     a)   Express the given signal sequence as time shifted impulse $x(n)=\{1, 3, 4, -7, 8, -15, 18, 20\}$.

     b)   Differentiate between odd and even signal with suitable example and neat diagram.

     c)   Check whether the given systems are linear, shift variant, causal and stable

$$y[n] = x[n] + n\, x[n+1]$$

d) Find $X(\infty)$ if $X(z)$ is given by, $X(z) = \dfrac{z^2}{(z-1)(z-0.3)}$.

e) Find the inverse z- transform of $X(z) = \dfrac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}}$ for $|z|>2$.

f) Compute the convolution of the following signals by means of z-transform.

$$x_1(n) = \begin{cases} \left(\dfrac{1}{3}\right)^n, & n \geq 0 \\ \left(\dfrac{1}{2}\right)^n, & n < 0 \end{cases}$$

$$x_2(n) = \left(\dfrac{1}{2}\right)^n u(n)$$

g) Perform the circular convolution of the following two sequences $x_1(n)$= {2, 1, 2, 1} and $x_2(n)$= {1, 2, 3, 4} using the time domain formula.

h) For the analog transfer function $F(s) = \dfrac{2}{(s+1)(s+2)}$. Determine its digital equivalent using

bilinear transformation method taking T= 1sec.

i) Realize the given system in Direct Form-I

$$y[n] = 0.5y[n-1] - 0.25y[n-2] + x[n] + 0.4\, x[n-1]$$

j) Obtain the cascade structures for the system represented by the difference equation:

$$Y(n) = 0.1\, y(n-1) + 0.2\, y(n-2) + 3x(n) + 3.6\, x(n-1) + 0.6\, x(n-2)$$

k) Write short note on Architecture of ADSP series of digital signal processors.

l) Explain LMS algorithm in terms of gradient descent method.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Describe an LTI system with an example? Show that an LTI system combined with time scaling property may result in a Time-variant system. **(16)**

Q4 Perform linear convolution of the following sequence by overlap-add and overlap-save method. **(16)**

$x(n)$ = {1, −1, 2, −2, 3, −3, 4, −4}, $h(n)$ = {−1, 1} and compare the result.

Q5 Compute the DFT of the sequence $x(n)$= {1, 2, 3, 4, 4, 3, 2, 1} using the decimation in frequency (DIF) algorithm. **(16)**

Q6 Explain the method of designing a linear-phase FIR filter using windows with supporting mathematical expressions. What are the basic differences between FIR and IIR Filter (at least four)? **(16)**

Registration No :

**Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and
any two from Part-III.
The figures in the right hand margin indicate marks.**

Part-I

Q1   Answer the following questions :   **(2 x 10)**

a)   Give an example of ring which is not an integral domain.
b)   Find all the left cosets of the subgroup $(3\mathbb{Z},+)$ for the group $(\mathbb{Z},+)$.
c)   What is the order of element $\begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 2 \end{pmatrix}$ in the permutation group S_3 under composition?
d)   Find the distance between 111001 and 011010
e)   Simplify the Boolean expressions $xy\bar{z} + \bar{x}y + xyz$
f)   Is bipartite graph a tree? Draw a 3-regular graph.
g)   Define (a) complemented and (b) distributive lattice.
h)   Find the number of edges in a graph G having 3 vertices of degree 4 and 4 vertices of degree 3
i)   In any group of 27 English words, there must be at least _____ that begins with the same letter.
j)   Find the converse statement "If you want to conduct an online meeting, then you have to create a meeting link."

Part-II

**Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight   (6 × 8)
out of Twelve)**

a)   Using mathematical induction prove that $3 + 3.5 + 3.5^2 + \cdots. + 3.5^n = \frac{3(5^{n+1}-1)}{4}$ for positive integer n
b)   Solve the recurrence relation using the generating function $a_n = a_{n-2}$ given that $a_0 = 0$ and $a_1 = 1$.
c)   If G is a simple connected planar graph with e edges and v vertices where $v \geq 3$, then $e \leq 3v - 6$
d)   Using the truth table prove that $\sim(p \to q) \equiv p \wedge \sim q$

e) Determine the validity of the argument, "Robbery was the motive for the crime only if the victim had money in his pockets. But robbery or revenge was the motive for the crime. Therefore, revenge must have been the motive for the crime"

f) Is K_4 a Hamilton circuit? Justify

g) Explain (a) Spanning Tree (b) Boolean Algebra c) Karnaugh map

h) Verify whether R is equivalence, $L = \{all\ real\ lines\ in\ a\ plane\}$ and $R = \{(l,m)|\ l\ is\ perpendicular\ to\ m\}$.

i) Without using a truth table prove that $\sim p \wedge (p \vee q) \equiv \sim p \wedge q$

j) A ring R is commutative if and only if $(a+b)(a-b) = a^2 - b^2, \forall a, b \in R$

k) Let x, y are real numbers and $Q(x,y): xy = 1$. What is the truth value of (a) $\exists y \forall x Q(x,y)$, (b) $\forall y \forall x Q(x,y)$?

l) Let the function $f: \mathbb{N} \to \mathbb{N}$ defined by $f(x) = \frac{x}{2}$. Is it one-one? Is it onto?

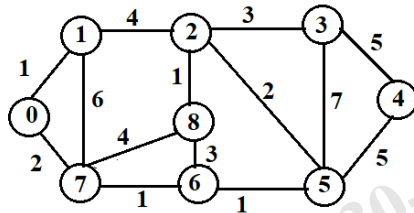## Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3
a) What is the chromatic number of $K_{2,3}$?   **(2+8+6)**
b) Using Kruskal's algorithm, find the minimum spanning tree

c) Show that in a ring (R,+,.), cancellation laws hold under addition.

Q4 Given the poset $(\{1,2,3,5,6,7,10,20,30,60,70\},\ /)$ where $/$ denotes division. i)Draw the Hasse Diagram for this poset. ii) Find the minimal elements. iii) Find the maximal elements. iv) Find the greatest element v) Find the least element vi) Is this poset a lattice? Justify your answer.   **(3+3+3+22+3)**

Q5 Let S={a,b,c,d} and $R = \{(a,b),(b,c),(c,d),(b,a)\}$. Find the transitive closure of R using Warshall's algorithm. Define Ring.   **(12+4)**

Q6 Prove that $G = \{1,2,3,4\}$ form a group under multiplication modulo 5. Let $f: G \to H$ is a group homomorphism. Then $f(e_G) = e_H$ and for any $g \epsilon G, f(g^{-1}) = f(g)^{-1}$ **(8+8)**

Total Number of Pages: 02　　　　　　　**Integrated Dual Degree (B.Tech and M.Tech)**
REL4D003/ REE4D003

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Electrical and Electronics Measurement
BRANCH(S): ELECTRICAL, EEE, EE
Time: 3 Hours
Max Marks: 100
Q.Code: P589
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1　　**Answer the following questions:**　　　　　　　　　　　　　　　**(2 x 10)**
　　a)　What are the different methods used for measurement of medium and high resistance.
　　b)　The measured value of a capacitor is 205.3µF, whereas its true value is 201.4µF. Find the value of relative error.
　　c)　Explain the basic principle of operation of a constant resistance d.c. potentiometer.
　　d)　Explain the difference between gravity control and spring control.
　　e)　What is the Lissajous pattern with equal voltages of equal frequency and phase shift by 90°?
　　f)　Explain the phenomena of Creeping. If an energy meter disc makes 10 revolutions in 100 seconds when a load of 360 W is connected to it, determine the meter constant revolution/KWh.
　　g)　A moving coil of a meter has 100 turns, and a length and depth of 10mm and 20mm, respectively. It is positioned in a uniform radial flux density of 200mT. The coil carries a current of 50mA. Find the torque on the coil.
　　h)　Define Logarithmic decrement in Galvanometer.
　　i)　What do you understand by burden in instrument transformer?
　　j)　In a digital voltmeter the oscillator frequency is 400 kHz, the ramp voltage falls from 8V to 0V in 20 msec. Find the number of pulses counted by the counter.

Part-II

Q2　　**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**　　**(6 × 8)**
　　a)　A coil of a ballistic galvanometer has 115 turns of mean area 25×40 mm^2. The flux density in the air gap is 0.12 wb/m^2 and the moment of inertia is 0.5×10^{-6} Kg-m^2. The stiffness is 45×10^{-6} Nm/rad. What current must be passed to give a deflection of 1000° and what resistance must be added in series with the movement to give critical damping?
　　b)　Explain how voltage and Current are measured with the help of a CRO.
　　c)　Explain working principle of mechanical resonance type frequency meter.

d) A 4 terminal resistor of approximately 50 µohm resistance was measured by means of a Kelvin bridge having the following component:

Standard resistor = 100.03 µohm, Inner ratio ams = 100.31 µohm and 200 µohm: outer ratio ams = 100.24 ohm and 200 ohm, resistance of link connecting the standard and the unknown resistance = 700 µohm. Calculate the unknown resistance.

e) The exciting current of a ring core CT of ratio 1000/5 A. When operating at full primary current and with a secondary burden of non inductive resistance of 1ohm is 1A at a p.f. of 0.4. (I) Calculate the phase displacement between primary and secondary current. (II) The ratio error at full load, assuming that there has been no compensation.

f) If the vertical amplifier of an oscilloscope has a bandwidth of 15MHz. What is the fastest rise time that an input may have to be displayed without distortion?

g) Draw the block diagram of digital voltmeter.

h) Explain different types of errors in measuring instrument.

i) The inductive reactance of the pressure coil circuit of a dynamometer wattmeter is 0.4% of it resistance at normal frequency 50 Hz and the capacitance is negligible, Find the percentage error and correction factor due to the reactance for load at 0.707 p.f. lagging.

j) In an indicating PMMC type ammeter the current through the coil for full scale deflection is 5mA. Coil resistance is 5 ohm and swamping resistance is 4 ohm. The meter is to be used for measuring current up to 1 ampere. Calculate the value of shunt resistance required. What arrangement is required to be made to compensate to temperature change which may occur? Derive necessary expression.

k) Describe the construction and working principle of a single-phase energy meter.

l) Explain the balanced condition of Anderson's bridge with appropriate phasor diagram, also state the advantage and disadvantage of the bridge.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Describe the construction details of an electrodynamometer type wattmeter. Derive the expression for torque when the instrument is used on AC. **(8x2)**

     b) Explain the working principle of Spectrum Analyzer.

Q4 **a)** Explain the construction and principle of working of a Linear Variable Differential Transformer (LVDT). Explain how the magnitude and direction of the displacement of core of an LVDT detected. **(8x2)**

     b) Explain Measurement of Mutual Inductance by Felici's Method.

Q5 Draw the equivalent circuit and phasor diagram of a Current transformer. Derive the expressions for its ratio and phase angle errors. Describe the assumptions made for deviation of errors. **(16)**

Q6 Write short notes on **(8x2)**
(a) Hall Effect Transducer
(b) Power Factor Meters

Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)
Sub_Code: REL4C002/REE4C002

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Electrical Machines-I
BRANCH(S): ELECTRICAL, EEE, EE
Time: 3 Hour
Max Marks: 100
Q.Code: P315
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	Answer the following questions:	(2 x 10)

  a) What is the voltage regulation of a transformer?
  b) What is the difference between lap and wave winding?
  c) What is the purpose of interpoles and compensating windings in dc machines?
  d) Define Biot Savart Law.
  e) Draw the open circuit characteristic of a separately excited DC generator.
  f) What are the conditions for the voltage build-up in a shunt generator?
  g) What is Ampere Law?
  h) What is commutation in DC machine?
  i) Define flux, reluctance, and inductance of the magnetic circuit.
  j) A single-phase transformer when supplied from 200 V, 50 Hz has eddy current loss of 50 W. If the transform is connected to a voltage 300 V, 50 Hz, what will be the eddy current loss?

Part-II

Q2	Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)	(6 × 8)

  a) By using a phasor diagram explain the Scott connection of the transformer.
  b) The efficiency of a 500 KVA, 110/220 V, 50 Hz, single-phase transformer is 98.5% at half load at 0.85 pf leading and 98.8% at full-load upf. Determine (I) iron loss (II) Full-load copper-loss
  c) Explain the Open delta (V) connection and draw the necessary diagram.
  d) Explain how to separate the hysteresis and eddy current losses in 1 phase transformer.
  e) Explain different types of cooling systems used in Transformer.
  f) Explain the Parallel operation of 3-phase transformers.
  g) Explain the inrush current of the transformer during the starting condition.
  h) Derive the EMF equation of the DC generator.
  i) Derive the torque equation of the DC machine.

j) Explain the open circuit test and find out the Ro and Xm of the transformer.

k) Derive the torque equation as a partial derivative of stored energy concerning the angular position of a rotating element.

l) The 2000/200 V, 20 kVA transformer is connected as a step-up auto-transformer. The 200 V winding has enough insulation to withstand 2200 V to ground. Calculate: (I) The LV and HV side voltage ratings of the autotransformer (ii) its kVA rating (iii) kVA transferred inductively and conductively.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Draw the equivalent circuit, approximate equivalent circuit, and the phase diagram of the transformer. **(16)**

Q4 Explain neutral floating of 3phase Y Y connection? What is the remedy to overcome the problem? **(16)**

Q5 A 400 KVA load at 0.7 power factor lagging is supplied by three single-phase transformers connected in Delta-Delta. Each of the Delta-Delta transformers is rated at 200 KVA, 2300/230 V. If one defective transformer is removed from service, calculate for the V-V connection; **(16)**
I. The KVA load carried by each transformer, II. Percent rated load carried by each transformer, III. Total KVA ratings of the transformer bank V-V, IV. Ratio of V-V bank to Delta-Delta bank transformer ratings, V. Percent increases in load on each transformer when one transformer is removed.

Q6 What is the armature reaction of the DC machine? Explain the cross-magnetization and demagnetization effect. **(16)**

4th Semester Reg /Back Examination: 2023-24
Engineering Economics
ELECTRICAL & C.E,ELECTRONICS & C.E, AE,AEIE,AG,AUTO,BIOMED,BIOTECH,CIVIL,CSE,
CSEAIME,CSEDS,CSIT,CST,ECE,EEE,EIE,ELECTRICAL,ENV,ETC,IT,MECH,METTA,MINERAL,MINING,MME,
AE,AEIE,AG,AUTO,BIOMED,BIOTECH,CIVIL,CSE
Time : 3 Hour
Max Marks : 100
Q. Code : P484
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   (2 x 10)
   a)   What are the three basic problems of an economy?
   b)   Define elasticity of demand
   c)   Define total, average and marginal costs.

   d)   Distinguish between 'short-run' and 'long run' in the context of production.
   e)   What do you mean by the perfectly competitive market?
   f)   How do you calculate "Break-even Point"?
   g)   Distinguish between an annuity due and deferred annuity
   h)   What do you mean by depreciable property?
   i)   What are the two essential functions of a bank?
   j)   What is demand-pull inflation?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of**   (6 × 8)
   Twelve)

   a)   Distinguish between a change in demand and change in quantity demanded. Explain the concept with the help of diagrams.
   b)   Suppose that demand is given by the equation QD=500 – 50P, where QD is the quantity demanded, and P is the price of the good. Supply is described by the equation QS= 50 + 25P where QS is quantity supplied. What is the equilibrium price and quantity?
   c)   Explain three stages of production in the short-run
   d)   What is the relationship between average cost and marginal cost? If the marginal cost is rising does it mean that the average cost must also be rising?
   e)   What is the P/ V ratio? What are the various applications of P/V ratio?
   f)   Differentiate between perfect competition and monopoly form of market.
   g)   A project has an initial cost of Rs.100, 000 and uniform annual benefits of Rs.12, 500. At the end of its 8-year useful life, its salvage value is Rs. 30,000. What is the net present worth of the project at an interest of 10 percent compounded annually?

h) A company has borrowed Rs.200,000 to purchase equipment. The loan carries an interest rate of 5% per year and is to be repaid in equal installments over the next 7 years. What is the amount of the annual installment?

i) Distinguish between SL method and DDB methods of depreciation.

j) What are the various causes of depreciation?

k) Define central banking and distinguish this concept from that of commercial banking.

l) Discuss the various measures to control Inflation?

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 State and explain with suitable diagrams the law of demand. What are the reasons for the downward slope of the demand? **(16)**

Q4 The following data are obtained from ABC Co. Ltd. **(16)**
Sales = Rs. 1,00,000
Variable Cost= Rs. 60,000
Fixed Cost = Rs. 30,000
You are required to calculate:
(i) P/V ratio
(ii) Break-even point
(iii) Margin of Safety
(iv) Break-even point when there is 20 per cent increase in selling price.
(v) Break-even point when there is 10% decrease in Fixed Costs.

Q5 An engineer has two bids for an elevator to be installed in a new building. The details of the bids for the elevators are as follows: **(16)**

	Initial Cost(Rs.)	Service Life(years)	Annual Operation Cost(Rs.)
Alpha Elevator	4,50,000	15	27,000
Beta Elevator	5,40,000	15	28,500

Determine which bid should be accepted, based on the present worth method of comparison assuming a 15% interest rate, compounded annually.

Q6 Explain the different functions of commercial banks **(16)**

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**

- **a)** In a cyclic process, heat transfers are + 14.7 kJ, − 25.2 kJ, − 3.56 kJ, and +31.5 kJ. Estimate the total work for this cyclic process.
- **b)** 100 % thermal efficiency of a heat engine cycle is not attainable. Justify the statement.
- **c)** Highlight the criteria for reversibility, irreversibility, and impossibility of a thermodynamic process.
- **d)** Describe the principle of increase of entropy for an isolated system.
- **e)** Show that internal energy is a property of the system.
- **f)** Explain the terms exergy and anergy.
- **g)** Draw p-v diagram for a pure substance.
- **h)** Second law of thermodynamics is often called as a directional law of nature. Justify.
- **i)** Explain quasi-static process with a suitable example.
- **j)** Explain Carnot's theorem.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**

- **a)** Establish the equivalence of Kelvin-Planck and Clausius statement.
- **b)** A piston cylinder device operates 1 kg of fluid at 20 atm. Pressure. The initial volume is 0.04 m^3. The fluid is allowed to expand reversibly following a process $pV^{1.45}$ = Constant so that the volume becomes double. The fluid is then cooled at constant pressure until the piston comes back to the original position. Keeping the piston unaltered, heat is added reversibly to restore it to the initial pressure. Calculate work done in the cycle.
- **c)** Show that the COP of a heat pump is greater than the COP of the refrigerator by unity.
- **d)** A heat engine operates between 290 ^{o}C and 8.5 ^{o}C. 300 kJ/s of heat is supplied at 290 ^{o}C and heat is rejected at 8.5 ^{o}C. Classify the cycles if:

  (i) 215 kJ/s are rejected, (ii) 75 kJ/s are rejected, and (iii)150 kJ/s are rejected.
- **e)** 5 kg of water at 0 ^{o}C is exposed to reservoir at 98 ^{o}C. Calculate the change of entropy of water, reservoir and universe. Assume that specific heat of water is 4.187 kJ/kg K.
- **f)** Describe the working principle of Carnot cycle with a neat sketch. Highlight the assumptions considered. What are the limitations in the cycle?

g) Explain the term "mean temperature of heat addition". Highlight the effect of superheating on it in a Rankine cycle.

h) Discuss the performance of Otto, Diesel, and Dual cycles for the same maximum pressure and temperature with neat sketch of P-V and T-S diagrams.

i) Explain the following terms associated in a gas power cycle:
Air Standard Efficiency, Mean Effective Pressure, Brake Thermal Efficiency, Mechanical Efficiency, Relative Efficiency, and Volumetric Efficiency.

j) A Diesel engine has a compression ratio of 14 and cut off takes place at 6% of the stroke. Find the air standard efficiency.

k) Explain the working principle of vapor compression refrigeration cycle. Differentiate between ideal and actual vapor compression refrigeration cycle in a T-S diagram.

l) Explain air refrigeration cycle highlighting its working principle. Mention the assumptions considered for its analysis. Highlight its advantages.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) A heat engine working on Carnot cycle, absorbs Q heat from heat source and converts one fourth of heat Q into work. If the temperature of the heat sink is decreased by 100 ^{o}C, the efficiency becomes doubled. Calculate the temperature of source and sink. **(8+8)**

b) An investor claims that his engine has the following specifications:
Temperature limits: 727 ^{o}C and 27 ^{o}C
Power developed: 80 kW.
Fuel supplied: 7.92 kg/hr.
Calorific value of fuel: 48,000 kJ/kg
Is the claim of investor true or false? Justify your answer.

Q4 a) A fluid undergoes a reversible adiabatic compression from pressure 1 MPa and volume 0.3 m^3 to volume 0.05 m^3, according to the law of $pV^{1.3}$ = Constant. Determine, (i) Work done, (ii) heat transfer, (iii) change in internal energy, (iv) change of enthalpy, and (v) change of entropy. **(8+8)**

b) 2 kg of water at 94 ^{o}C are mixed with 3 kg of water at 10 ^{o}C in an isolated system. Calculate the change of entropy due to mixing process.

Q5 a) A system at 500 K receives 7200 kJ/min heat from a source at 1000 K. The temperature of atmosphere is 300 K. Assuming that the temperature of system and source remain constant during heat transfer, find out (i) the entropy produced during heat transfer, and (ii) the decrease in available energy after heat transfer. **(8+8)**

b) State Gouy-Stodola theorem. Explain its application with respect to a heat transfer process occurring over a finite temperature difference.

Q6 A cyclic steam power plant is to be designed for a steam temperature at turbine inlet of 360 ^{o}C and an exhaust pressure of 0.08 bar. After isentropic expansion of steam in turbine, the moisture content at the turbine exhaust is not to exceed 15%. Determine the greatest allowable steam pressure at the turbine inlet and calculate the Rankine cycle efficiency for these steam conditions. Also, estimate the mean temperature of heat addition. **(16)**

Total Number of Pages: 02

Integrated Dual Degree (B.Tech and M.Tech)
Sub_Code: RME4C003/RCI4G001

4ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: Introduction To Physical Metallurgy and Engineering Materials
BRANCH(S): MECH, MMEAM, C&EE, CIVIL, CE, ME
Time: 3 Hours
Max Marks: 100
Q.Code: P591
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   (2 x 10)

a) Draw [$1\bar{2}0$] and ($\bar{2}11$) in cubic crystal system.

b) Distinguish between unit cell and primitive cell.

c) At 910℃ the γ-Fe transforms to α-Fe. What is the percentage of volume expansion?

d) Derive Gibb's phase rule. What is the minimum and maximum number of phases which could exist in a pure metal?

e) Why are grain boundaries favorable sites for nucleation or growth for precipitates?

f) Define composite.

g) It is often thought that the species having lower activation energy diffuses faster than the one having higher activation energy. Is this always true?

h) What is constitutional super-cooling? When does this take place?

i) What is Burger's vector?

j) What is Zener pinning effect?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 × 8)

a) What is cooling curve? Draw the cooling curves for binary solid solution alloy and binary eutectic alloy?

b) For a 0.35 wt% C plain carbon steel at a temperature just below the eutectoid temperature determine:
   I. Fraction of total ferrite and cementite phase.
  II. Fraction of the pro-eutectoid ferrite and pearlite.
 III. Fraction of eutectoid ferrite.

c) Derive c/a ratio of HCP crystal. Find out its APF.

d) Explain different point defects.

e) Write short note on: Scattering.

f) What is Metallography? Discuss about polishing techniques for metals and alloys. Give the requirements of etching in microscopic observation.

g) Explain the factors affecting hardenability.

h) Mention the properties and applications of grey cast iron and compare it with white cast iron.

i) Explain briefly the SC, BCC, and FCC structure and calculate the atomic packing factor for BCC structure.

j) What is CRSS? Write the expression for CRSS. Determine tensile stress that is applied along [$1\bar{1}0$] axis of a silver crystal to cause slip on the ($1\bar{1}1$) [$0\bar{1}1$] system. Given CRSS = 6 MPa.

k) What is recrystallization? What are the factors affecting recrystallization temperature?

l) Explain Fick's first and second laws of diffusion.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the Precipitation hardening mechanism for Al-4%Cu alloy. Also mention crystallographic aspects. Nickel, Aluminium, and Copper have face centered cubic structure yet Ni is soluble in copper whereas Al has only a limited solubility. Explain why it is so? **(16)**

Q4 What are polymers? Discuss the different Polymerization mechanisms with sketch. **(16)**

Q5 Draw a neat sketch of Fe-Fe$_3$C phase diagram. Show different phases. Explain different invariant reactions taking place in the system. **(16)**

Q6 Draw properly the T-T-T diagram of eutectoid, hypoeutectoid, and hypereutectoid steel. State its utility and limitations. Define critical cooling rate and actual cooling rate. **(16)**

Total Number of Pages: 02　　　　　　　　　　　　　　　　**Course: B.Tech**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　Sub_Code: RME4D002

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Mechanical Measurement, Metrology & Reliability
BRANCH(S): MECH
Time: 3 Hour
Max Marks: 100
Q.Code: P238
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1　**Answer the following questions:**　　　　　　　　　　　　　　　　**(2 x 10)**
　　a)　Define the terms "Quality" and "Reliability".
　　b)　What are the factors affecting the accuracy of the measuring system?
　　c)　Define calibration in the context of measurements.
　　d)　What is the difference between allowance and tolerance?
　　e)　What is a pyrometer? Write its application.
　　f)　Differentiate between analog transducers and digital transducers with examples.
　　g)　State and explain "Taylor's Principle" for Gauge design.
　　h)　What do you mean by Ra and Rz values of surface measurement?
　　i)　Explain the advantages and limitations of acceptance sampling over 100% inspection.
　　j)　What is the difference between maintainability and availability?

Part-II

Q2　**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**　**(6 × 8)**
　　a)　Describe the working principle and components of a typical measuring system. Explain the difference between static and dynamic characteristics of instruments.
　　b)　What are the various possible sources of errors in measurements? What do you understand by systematic error and random errors?
　　c)　Discuss the principle of operation and application of electrical transducers, focusing on their advantages and limitations compared to other transducer elements.
　　d)　Discuss the function and applications of intermediate elements such as amplifiers, operational amplifiers, differential and integrating elements, filters, A-D converters, and D-A converters in transducer systems.
　　e)　Explain two pressure measurement systems stating their advantages and limitations.
　　f)　Illustrate the various methods for measurement of the gear tooth thickness.
　　g)　Explain the working principle of stroboscope.

h) Explain the operating principles of obstruction meters for fluid flow measurement, including orifice plates, venturi meters, and Pitot tubes. Compare their performance characteristics in measuring both compressible and incompressible fluid flows.

i) Explain the different methods to measure the effective diameter of a thread. Derive the expression for effective diameter in case of three wire method.

j) Explain the concepts of straightness, flatness, and circularity as geometric tolerances. Provide examples of how these tolerances are specified and measured.

k) With suitable sketches, describe the working of Vibrometers and Accelerometers.

l) Compare and contrast MTTF and MTBFsampling plans, highlighting their advantages and limitations. Provide examples of scenarios where each plan would be most suitable.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are various possible sources of errors in measurement and how they are analyzed? Compare and contrast the advantages, limitations,and selection of different types of measuring instruments, such as mechanical, electrical, and optical instruments. **(16)**

Q4 a) Differentiate between "Hole Basis" and "Shaft Basis" Systems with sketches? Which is generally employed and why? **(8x2)**

b) Design the "Inspection" type of Plug and ring gauges to control the production of a part 50H7d8. Given: 50 mm lies in the step 30-50. For "d" shaft $FD = -16D^{0.44}\mu$. $IT6 = 10i$ and above it, tolerance magnitude is multiplied by 10 at each fifth step.

Q5 a) Explain bath-tub-curve and Markov model. **(8x2)**

b) A lot contains 1000 items out of which 10 are defective is to be inspected. A sample of 36 items is taken and if it contains 0 defective, the lot is accepted. If it contains 1,2 or 3 defectives in first sample, then a 2nd sample of 59 items is taken and if total number of defectives in 1st and 2nd samples is less than 3 then the lot is accepted. Calculate the probability of acceptance of the lot.

Q6 Write notes on: **(4x4)**
a) Systematic errors and Random errors
b) Precision, accuracy, and Repeatability
c) Line standard and end standard
d) Interchangeability and Selective assembly

Registration No:

4th Semester Regular/Back Examination: 2023-24
Organizational Behaviour

AE,AEIE,AERO,AUTO,BIOTECH,C&EE,CHEM,CIVIL,CSE,CSEAI,CSEAIME, ELECTRICAL & C.E., CSEDS,CSIT,CST,ECE,EEE,EIE,ELECTRICAL,ETC,IT,MANUTECH,MECH,METTA, MINING,MME,MMEAM,PLASTIC
Time: 3 Hour
Max Marks: 100
Q.Code : P486
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**
a)	Define Organizational Behaviour in your own words.	
b)	What is organization Culture? State in few lines.	
c)	What do you mean by Hierarchy of needs?	
d)	Define Team and state its importance.	
e)	Is positive attitude essential at workplace?	
f)	What is perception? State in few lines.	
g)	What is the meaning and importance of organizational change?	
h)	What are the limitations of OB?	
i)	Emotional intelligence is an essential requirement. Why?	
j)	Define Motivation. Why Motivation is important?	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**
a)	How significant is personality in an organization? Explain with example.	
b)	What is Maslow's Need Hierarchy theory? Elaborate it with diagram.	
c)	Right attitude can take an employee to a leadership position. Justify.	
d)	Change is the only truth. Do you agree? How do you manage change in an organization?	
e)	What is the scope and importance of OB? Explain.	
f)	Organization Behaviour is the sum of individual behavior. Comment.	
g)	How personality and job-fit theory works?	
h)	Explain how to create a positive work culture in theory? How it helps?	
i)	Group or Individual change is inevitable. How to deal with it?	
j)	What do you mean by strong and weak culture? Explain.	
k)	What are the barriers for attitudinal changes? How to overcome the same?	
l)	Social perception is a complex process. Comment.	

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Elucidate different OB framework. How Individual Behaviour & Organizational Behaviour reciprocate each other. **(16)**

Q4 What is Emotional Intelligence? How it affects the decision making and interpersonal relationship at work place. **(16)**

Q5 Motivation is essential for an employee in the organization. How to motivate the individual and the group. Explain. **(16)**

Q6 What is personality and Job-Fit theory? Discuss the application of personality test in organizational success. **(16)**

Total Number of Pages: 02   **Integrated Dual Degree (B.Tech and M.Tech)**
REL4C003/REC4D002/REE4C003/REI4D002

4ᵗʰSemester Regular/Back Examination: 2023-24
SUBJECT: Power Electronics
BRANCH(S): ELECTRICAL, ECE, ETC, EE, ECE, EEE, AEIE, EIE
Time: 3 Hour
Max Marks: 100
Q.Code: P410
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**
- **a)** Write the advantages of freewheeling diode.
- **b)** Write the drawbacks of resistant triggering method.
- **c)** Explain blanking time.
- **d)** What is the rms value of fundamental component of single phase bridge inverter if the input voltage is V.
- **e)** Explain why an anti-parallel diode is connected across each MOSFET in inverter.
- **f)** How is light triggering of a thyristor different from gate triggering?
- **g)** Why freewheeling diode is not required in a semi converter?
- **h)** What are the advantages of bipolar switching overunipolar switching in SPWM controlstrategy as applied to inverters?
- **i)** What is secondary breakdown of BJT?
- **j)** What is the importance of snubber circuit?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**
- **a)** A single-phase full wave rectifier with R-L-E load has L = 6.5mH, R = 2.5Ω, and E = 10V. The input voltage is V_s = 120Vat 60Hz. Determine (I) the steady state load current at wt = 0, (II) the average diode current (III) the rms diode current (IV) the rms output current.
- **b)** The parameters of UJT are V_s = 30 v, η =0.51, I_P = 10µA,V_V = 3.5V, and I_v = 10mA.The frequency of oscillation is f = 60Hz,and the width of triggering pulse is tg = 50µs. Assume V_D = 0.5. Design the triggering circuit.
- **c)** Explain with neat sketch the protection circuit of SCR.
- **d)** Describe the principle of step up chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle.
- **e)** Draw and explain the structure and characteristics power MOSFET and explain how it is different from BJT.

f) A single-phase Semi converter feed power to RLE load. For discontinuous load current, draw the output voltage, loadcurrent, source current and freewheeling diode current waveforms as a function of time when

(I) Extinction angle $\beta > \Pi$ (II) $\beta < \Pi$ with $V_m \sin \beta < E$

g) Draw and explain the dynamic characteristics of SCR during ON and OFF.

h) For a step-down chopper, input dc voltage is 230V, load resistance=10Ω. For the duty cycle of 0.5, Calculate I) the average and the rms values of output voltage and (II) Chopper frequency.

i) Explain IGBT with its circuit symbol and switching characteristics.

j) The input voltage to an SCR connected with snubber circuit is Vs=200V. The load and stray inductances are negligible and the thyristor is operated at a frequency of fs=2KHz. If the required (dv/dt) = 100 V/μs,and the discharge current is to be limited to 100A, determine the value of RC Snubber circuit.

k) A number of SCRs, each with rating of 2000V and 50A, are to be used in series-parallel combination in a circuit to handle 11KV and 400A. For a derating factor of 0.15, calculate the number of SCRs in series and parallel units. The maximum difference in their reverse recovery charge is 20 microcoulombs. Calculate (I) the value of dynamic equalizing capacitance and (II) the voltage across each of the slow thyristor in case one series connected SCR is fast.

l) For a buck boost converter, the input dc voltage is 14V. The duty cycle is 0.6 with switching frequency of 25KHz.The inductance L = 180μH and filter capacitance C = 220 μF. If the average load current is 1.5A, Compute

(i) The average output voltage

(ii) Peak to peak output voltage ripple

(iii) Peak to peak current in the inductor

(iv)The peak current of the device

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3   Explain 180° conduction scheme of a three-phase voltage source inverter with relevant circuit diagram and waveform.   **(16)**

Q4   With neat sketch explain the operation of three phase full wave ac to dc converter for R load with firing angle 15°.   **(16)**

Q5   Write short notes on   **(8x2)**
(I) Sinusoidal PWM
(II) Buck Converter

Q6   Explain the operations of four quadrant chopper.   **(16)**

4ʰ Semester Regular/Back Examination: 2023-24
Principle of Programming Languages
CSE, CSEAI, CSEAIME, CSEDS
Time: 3 Hour
Max Marks: 100
Q. Code: P243
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1   Answer the following questions: **(2 x 10)**
   a)   Define the term "programming paradigm."
   b)   What is an attribute grammar?
   c)   Explain the concept of scope in programming languages.
   d)   Describe what is meant by type checking.
   e)   What is polymorphism in the context of programming languages?
   f)   Define higher-order functions.
   g)   What is first-order logic in logic programming?
   h)   Explain the concept of unification in logic programming.
   i)   What does "type checking" entail in functional languages?
   j)   Define concurrency in the context of programming languages.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 × 8)
   a)   Compare and contrast imperative and object-oriented programming paradigms.
   b)   Discuss the role of control abstraction in imperative languages.
   c)   Explain the difference between primitive and constructed data types.
   d)   Detail how exception handling works in object-oriented languages.
   e)   Describe the evaluation strategies used in functional languages.
   f)   Discuss the sequencing of control in logic programming languages.
   g)   Explain the implementation challenges of functional programming languages.
   h)   Outline how synchronization is managed in concurrent programming.
   i)   Discuss the safety and liveness properties in multithreaded programs.
   j)   Describe the SLD-resolution method used in logic programming.
   k)   What are the main aspects of operational semantics in formal semantics?
   l)   Explain how denotational semantics are applied to toy languages.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Write a simple C++/Java program that demonstrates the concept of inheritance and polymorphism. Ensure your program includes both base and derived classes also Include at least one virtual function and demonstrate its use. **(16)**

Q4 Create a Java method that uses exception handling to deal with potential input errors when converting a string representation of a number to an integer. The method should return the integer value if the conversion is successful and -1 if an exception occurs. **(16)**

Q5 Write a detailed analysis of concurrency in programming languages, focusing on communication and synchronization techniques, as well as shared memory and message passing models. Discuss how these elements influence software design decisions. **(16)**

Q6 Provide a comprehensive analysis of the various programming paradigms mentioned in the syllabus, including imperative, object-oriented, functional, and logic programming, focusing on their foundational theories and practical applications. **(16)**

Registration No.:

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCI4C003

4thSemester Regular/Back Examination: 2023-24
SUBJECT: Structural Analysis-I
BRANCH(S): C&EE,CIVIL,CE
Time: 3 Hour
Max Marks: 100
Q.Code: P415
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: **(2 x 10)**

a) Determine the degree of kinematic indeterminacy for a beam fixed at one end and hinged at other.

b) Determine the static indeterminacy of beam (AB) fixed at both ends.

c) Define conjugate beam.

d) State two silent features of arches.

e) Mention the advantages of fixed beam.

f) Define Strain energy.

g) State the Maxwell's Theorem of Reciprocal Displacements.

h) Define space truss.

i) Define maximum bending moment envelope.

j) Write two applications of influence line diagram.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 × 8)

a) Differentiate between force and displacement methods with examples.

b) A cantilever beam AB of span 8m is fixed at A and propped at B. The beam carries a uniformly distributed load of intensity 2 kN/m over its whole span. Determine the reaction at propped end.

c) State and explain Castigliano's theorems.

d) A three hinged circular arch hinged at the springing and crown points has span of 40m and central rise of 8m. It carries a uniformly distributed load 20kN/m over the left half the span. Find the vertical and horizontal reaction at supports.

e) Draw the influence line diagram for horizontal thrust (H) of a three hinged arch of span L and rise h.

f) Draw the influence line diagram for sheer force of a simply supported beam.

g) State and explain theorem of three moments with neat sketch.

h) Determine the deflection at free end (B) of cantilever beam (AB) of span length 10m using Castigliano's theorem. The beam is fixed at (A) and loaded with a uniformly distributed load of intensity 12 kN/m. The young's modulus of elasticity (E) is 200 GPa and moment of inertia is $500 \times 10^6 mm^4$.

i) Write short note on Virtual work method.

j) A cable loaded with 1kN per horizontal meter run is stretched between two supports at the same levels, 150m apart. If the central dip is 12 m, find the greatest and least tension in the cable.

k) Find the deflection at the free end of cantilever beam of span 10 and carrying a uniformly distributed load of intensity 20 kN/m over the entire span using conjugate beam method

l) Draw the bending moment diagram of a fixed beam of length 6m, carrying a concentrated load of 25 kN at the mid span.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A three hinged symmetric parabolic arch having span 50 m and central rise 10m. It carries a concentrated load of 40 kN at distance 15 m from right support and a uniformly distributed load of intensity 20 kN/m over left half portion of the arch. Determine the normal thrust and radial shear at a section 10 m from left end. **(16)**

Q4 Draw the bending moment diagram of a simply supported continuous beam ABC having span length AB = 4m and BC = 6 m. The span AB carries a point load of 20 kN at a distance of 1m from support A and span BC carries a uniformly distributed load of intensity 10kN/m throughout the span (BC). Use three moment theorem. All supports are simply supported. **(16)**

Q5 Determine the forces in all members assuming that the cross-sectional area and young's modulus of elasticity of all members are same. **(16)**
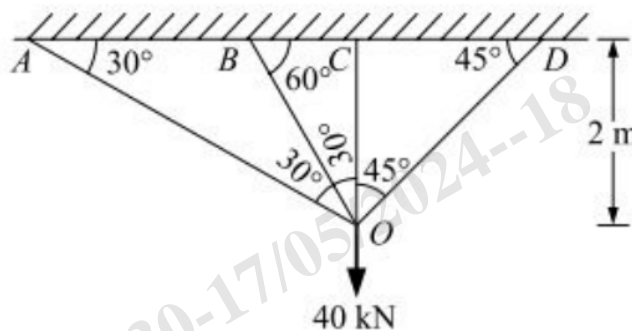
Q6 Draw the influence line diagram for reaction, shear force, bending moment of a cantilever beam of span "L". **(16)**

4th Semester Regular/Back Examination: 2023-24
SUBJECT: Surveying
BRANCH(S): C&EE,CIVIL,CE
Time: 3 Hour
Max Marks: 100
Q.Code: P065
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**

a) Define direct ranging and indirect ranging in chain surveying.

b) What is local attraction in compass surveying, and how does it affect the accuracy of measured bearings?

c) What is the relation between fore bearing and back bearing of a line? Is it required to take both the fore bearing and back bearing for a line,and why?

d) State the principle on which a prismatic compass works.

e) What is reciprocal levelling? When reciprocal levellingtechnique is used?

f) How bearing of a line can be measured by using a theodolite?

g) Define contour interval and horizontal equivalent in contouring. How are these two parameters related?

h) Draw sample contour lines to represent the ridge of a mountain and a vertical cliff.

i) Differentiate between active and passive remote sensing.

j) What is the working principle of a total station?

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**

a) Explain how to apply the corrections in measured length in a chain survey for the incorrect length of tape, pull, and sag.

b) During a chain survey, stations B and C were taken on the opposite sides of a pond. On the left of line BC, a line BD of length 300 m and a second line BE of length 200 m on the right of line BC was ranged. D, C, and E points are in the same straight line, where DC = 150 m and CE = 250 m. Calculate the distance between stations B and C.

c) Write the procedures to continue a levelling work across a lake or pond, across a high wall, and across a river.

d) Explain temporary adjustments of a levelhaving a three-foot screw levelling head.

e) Derive the expression for combined correction for curvature and refraction in levelling.

f) Describe the field procedure to determine the sensitivity of the bubble tube. Statethe factors and their influence on the sensitivity of the bubble tube.

g) Describe the repetition method for the measurement of horizontal angles using a theodolite.

h) Explain how to eliminate the error in measurement when the horizontal axis of a theodolite is not perpendicular to the vertical axis.

i) Explain how the nature of the ground and scale of the map affect the choice of contour interval for a map.

j) Explain the method to locate a contour gradient in the field with a level.

k) Describe selective and non-selective scattering in remote sensing.

l) Define spatial, spectral, temporal, and radiometric resolutions for a sensor.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 The following bearings were observed for a closed traverse.Determine the corrected included angles and corrected bearings of the lines, based on the principle that "Even if a station is affected by local attraction, the calculated included angles should be correct". **(16)**

Line	Fore bearing	Back bearing
AB	125°10'	306°35'
BC	175°40'	355°40'
CD	235°	54°20'
DE	315°10'	135°5'
EA	85°	263°50'

Q4 The following readings were taken during a reciprocal levelling between two stations A and B. Find the true difference in elevation between A and B. If the instrument had a collimation error of 0.003/150 m and the distance between the stations was 1100 m, find the error due to curvature and refraction. **(16)**

Instrument at	Staff reading taken at	
	A	**B**
A	1.525	2.825
B	1.530	2.605

Q5 The following consecutive staff readings (in m) were taken with a level: **(16)**

2.130, 1.505, 0.890, 2.090, 2.765, 1.162, 0.505, 1.880, 1.045, 2.585.

The level was shifted after 3rd, 6th and 8th readings. The 1st reading was taken on a benchmark of reduced level (RL) 400 m. Calculate RLs of all the staff locations using the Height of Instrument method. Apply all usual checks.

Q6 What are the different indirect methods of locating contours? Describe each method in detail with the help of neat sketches. **(16)**

4ᵗʰSemester Regular/Back Examination: 2023-24
SUBJECT:TRANSPORTATION ENGINEERING
BRANCH(S): C&EE,CIVIL,CE
Time: 3 Hour
Max Marks: 100
Q.Code: P327
**Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two
from Part-III.(IRC:37 and IRC:58 design code are not allowed inside the exam hall)
The figures in the right hand margin indicate marks.**

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**
a)	What are the classifications of road in urban area?	
b)	Define reconnaissance survey.	
c)	What are the factors on which over taking sight distance depends?	
d)	Differentiate between ruling gradient and minimum gradient.	
e)	Why 75% of design speed is taken for design of superelevation? What do you mean by equilibrium superelevation.	
f)	Differentiate between Basic capacity and Practical capacity.	
g)	Define Thirtieth highest design hourly volume.	
h)	What are the different stresses develop in flexible pavement?	
i)	Define Perpetual Pavement.	
j)	What is frost heaving in flexible pavement failure?	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**
a)	What are the salient features of second twenty years road plan?	
b)	Discuss briefly the special care to be taken while aligning hill road.	
c)	Calculate the safe passing sight distance for a four lane two-way NH. The speed of overtaking vehicle is 80 kmph and acceleration of overtaking vehicle is 0.89 m/sec². Assume any other data as per IRC.	
d)	Derive an expression for finding the Superelevation required on horizontal curve.	
e)	A valley curve is formed by descending gradient of 1 in 35 which meets an ascending gradient of 1 in 25. Design the total length of valley curve if the design speed is 25 m/sec so as to fulfill both comfort condition and head light sight distance. Allowable rate of change of centrifugal acceleration is 0.6 m/sec³, beam angle is 1⁰ and height of the head light above carriageway is 0.91 m. Assume any other data as per IRC.	

f) Design the length of transition curve for a two lane two-way NH having design speed 65 Kmph and radius of circular curve is 300 m. Allowable rate of introduction of superelevation is 1in 150. Pavement rotated about centre line. Assume any other data as per IRC.

g) Briefly explain the crushing test of road aggregate.

h) Explain the relationship between speed, travel time, volume, density, and capacity.

i) Briefly explain the floating car method for speed and delay study.

j) What are the various factors to be considered in pavement design?

k) What are the different layers of flexible pavement? Explain the significance of each.

l) Explain how the filter material is designed for use in sub-surface drainage system.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Enumerate the different methods of carrying out traffic volume studies. Indicate the principle of each. **(16)**

Q4 Briefly explain the step by step procedure for design of flexible pavement as per IRC:37-2012 **(16)**

Q5 Explain the various types of failures in Rigid pavements and their causes. **(16)**

Q6 Specify the materials required and specifications for construction of WBM roads. Write down the construction steps for WBM road. **(16)**