MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Data Structures
(CSE)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	A	Write an algorithm to delete an element anywhere from doubly linked list	[7M]
	B	Define a circular linked list and discuss its advantages and disadvantages compared to linear linked lists.	[7M]

OR

2	A	Discuss the operations involved in traversing a singly linked list. Provide algorithms for both iterative and recursive traversals.	[7M]
	B	Explain the processes of searching, insertion, and deletion in a doubly linked list. Provide examples to demonstrate each operation.	[7M]

SECTION-II

3	A	Describe the implementation of a stack using a linked list. Compare and contrast this implementation with the array-based approach.	[7M]
	B	Describe how a priority queue differs from a regular queue, and discuss its applications.	[7M]

OR

4	A	Explain how heaps can be used to implement a priority queue. Provide examples of operations on a priority queue implemented using heaps.	[7M]
	B	Explain how stacks are used in the evaluation of postfix expressions. Provide a detailed example with the stack operations.	[7M]

SECTION-III

5	A	Discuss the basic principles of binary search. Provide a step-by-step explanation and analyze its time complexity.	[7M]
	B	Sort the following list of elements by using Heapsort 35, 48, 20, 80, 22, 36, 100,5,15	[7M]

OR

6	A	Rearrange following numbers using quick sort: 10, 6, 3, 7, 17, 26, 56, 32, 72	[7M]
	B	Discuss the depth-first search (DFS) algorithm for graph traversal. Provide a step-by-step explanation and analyze its time complexity.	[7M]

SECTION-IV

7	A	Construct the open hash table and closed hash table for the input: 30, 20, 56, 75, 31, 19 using the hash function h(k)= k mod 11	[7M]
	B	Discuss rehashing as a strategy in hash table management. Explain the conditions under which rehashing is performed and its role in maintaining an	[7M]

efficient hash table.

<div align="center">OR</div>

8	A	Insert the following elements into the hash table by using Quadratic probing (size of the hash table 10) 30, 45, 28, 65, 26, 77, 40, 11	[9M]
	B	Is linear probing and open addressing same? Justify your answer.	[5M]

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SECTION-V

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9	A	What is a binary search tree? Construct a binary search tree given the pre-order traversal and in-order traversals as follows: Pre-Order Traversal: G B Q A C K F P D E R H In-Order Traversal: Q B K C F A G P E D H R	[7M]
	B	Compare and contrast B+ Trees with B-Trees in terms of structure, operations, and applications.	[7M]

<div align="center">OR</div>

10	A	Explain the steps involved in deleting a node from an AVL Tree. Discuss the rotations used to maintain balance and analyze the time complexity of the deletion operation.	[7M]
	B	Define a B-Tree of order m and discuss its properties. Explain how B-Trees differ from binary trees and why they are suitable for certain applications.	[7M]

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Operating Systems
(CSE & IT)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 *A* Define the concept of an operating system. Discuss its primary functions and why it is essential for computer systems. **[7M]**

   B Discuss the role of the Process Control Block (PCB) in managing processes. Explain the information stored in the PCB. **[7M]**

OR

2 *A* Explore the benefits and challenges associated with implementing a virtual machine in an operating system. **[7M]**

   B Explore the various states that a thread can be in during its lifecycle. Discuss the transitions between these states. **[7M]**

SECTION-II

3 *A* Define and elaborate on the different types of schedulers in an operating system. Discuss their roles and responsibilities. **[7M]**

   B Explain the First-Come, First-Served (FCFS) scheduling algorithm. Discuss its merits and demerits **[7M]**

OR

4 *A* Explain Real-Time scheduling, with a focus on Rate Monotonic (RM) and Earliest Deadline First (EDF) scheduling algorithms. **[7M]**

   B Discuss the concept of a race condition in the context of concurrent processes. Explain the challenges and consequences of race conditions. **[7M]**

SECTION-III

5 *A* Define the basic concepts of memory management in an operating system. Discuss the significance of logical and physical address maps. **[7M]**

   B Explain the principle of operation of paging in memory management. Discuss how pages are allocated and the advantages of using paging. **[7M]**

OR

6 Discuss the optimal page replacement algorithm. Explain its theoretical foundation and how it ensures the most efficient use of virtual memory. **[14M]**

SECTION-IV

7 Define the concept of a file in the context of file management. Discuss the various attributes that can be associated with a file. **[14M]**

OR

8 *A* Explore optimization techniques for file systems, such as caching and indexing, to enhance efficiency and performance. **[7M]**

   B Discuss the concept of I/O buffering and its role in optimizing data transfer **[7M]**

between devices and the main memory.

SECTION-V

9   A   Discuss strategies for preventing deadlocks in a system. Explain how each **[7M]** strategy contributes to avoiding the occurrence of deadlocks.

     B   Explain the Banker's algorithm as a technique for deadlock avoidance. **[7M]** Discuss how the Banker's algorithm ensures a safe state and prevents potential deadlocks.

OR

10   A   Discuss the SSTF disk scheduling algorithm. Explain how it minimizes seek **[7M]** time and its potential drawbacks.

     B   Discuss advanced disk management techniques. Explain how these **[7M]** techniques enhance data reliability and availability.

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R18

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Computer Organization
(CSE)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	A	A digital computer has a common bus system for 4 registers of 4 bits each. The bus constructed with multiplexers: i. How many selection lines are there in each multiplexer ii. What size of multiplexers are needed iii. How many multiplexers are there in the bus? Also draw the bus system	**[7M]**
	B	Explain the Error detection and correction codes	**[7M]**

OR

2	A	Using Booth algorithm perform the multiplication of the signed numbers 010111 and 110110. Verify the answer in decimal.	**[7M]**
	B	What is system software? What are the various functions performed by system software?	**[7M]**

SECTION-II

3	A	Explain the operation of timing and control unit during the execution of an instruction.	**[7M]**
	B	Illustrate the computer registers with examples.	**[7M]**

OR

4	A	Explain arithmetic, logical and shift operations with examples.	**[7M]**
	B	Define and discuss the types of registers.	**[7M]**

SECTION-III

5	A	Briefly explain microprogrammed control organization with neat block diagram.	**[7M]**
	B	Explain the difference between hardwired control and micro programmed control. Is it possible to have a hardwired control associated with a control memory.	**[7M]**

OR

6	A	What is the significance of Addressing modes? Explain.	**[7M]**
	B	Illustrate the working of a micro program sequencer with the help of diagrams.	**[7M]**

SECTION-IV

7	A	Define the Read Only Memory. Explain in detail the types of ROM's.	**[7M]**
	B	Explain the block diagram of Associative memory**.**	**[7M]**

OR

8	A	Explain briefly about Associate-mapped and set-associate mapped cache and	**[7M]**

Write a short note on flash memory.

    B   Difference between the Cache memory-size and block size.   **[7M]**

SECTION-V

9   *A*   Discuss the role of I/O devices in the Input-Output Organization of a computer. How are these devices coordinated and managed to ensure efficient data transfer between the CPU and external peripherals?   **[7M]**

    B   Discuss about the I/O device interfaces.   **[7M]**

OR

10   *A*   Explore the role of interrupt handlers in managing interrupts and exceptions. How are these handlers programmed, and what steps are taken to ensure a smooth transition back to the normal program flow after an interrupt or exception is serviced?   **[7M]**

    B   Write detailed about the x86 architecture.   **[7M]**

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Discrete Mathematics
(CSE & IT)

Roll No										

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1   **A**   Show that $\neg(p \to q) \, and \, (p \wedge \neg q)$ are logically equivalent   **[7M]**

    B   Show that t is a valid conclusion from the premises $p \to q$,   **[7M]**
$q \to r, r \to s, \neg s \, and \, p \vee t$

OR

2   **A**   Find the principal Conjunctive normal form of $(\neg p \to r) \wedge (q \leftrightarrow p)$ **[7M]**

    B   Define Quantifiers , Express the statements into logical expression   **[7M]**
      i) Some student in the class has visited Mexico
      ii) Every student in the class has visited Canada OR Mexico

SECTION-II

3   Define Equivalence Relation , prove that the relation R on the set of   **[14M]** integers defined by $R = \{(x,y): x - y \text{ is divisible by } 6\}$ is an Equivalence relation , where x and y are integers

OR

4   **A**   Draw the Hasse diagram for representing the partial ordering   **[7M]** {(a,b) / a divides b } on the set {1,2,3,4,6,8,12}

    B   Let $f: z \to z$, $g: z \to z$ defined as $f(x) = 2x + 3$, $g(x) = 3x + 2$ find   **[7M]** i) $fog(x)$ ii) $gof(x)$

SECTION-III

5   **A**   Prove that the set $\{0,1,2,3,4\}$ is a finite group under addition modulo 5   **[7M]** as composition

    B   How many different words can be formed with the letters of the word   **[7M]** 'MATHEMATICS'?

OR

6   **A**   Define Homomorphism , show that $f: G \to G'$ defined as $f(x) = e^x$ **[7M]** is a Homomorphism , where G is a group under addition and G' is a group under multiplication

    B   Find the coefficient of $x^3 y^2 z^4$ in $(x + y + z)^9$ using multinomial   **[7M]** theorem

SECTION-IV

7   Solve the recurrence relation $a_n = 3a_{n-1} + 2$, $a_0 = 1$ by using   **[14M]** generating function method
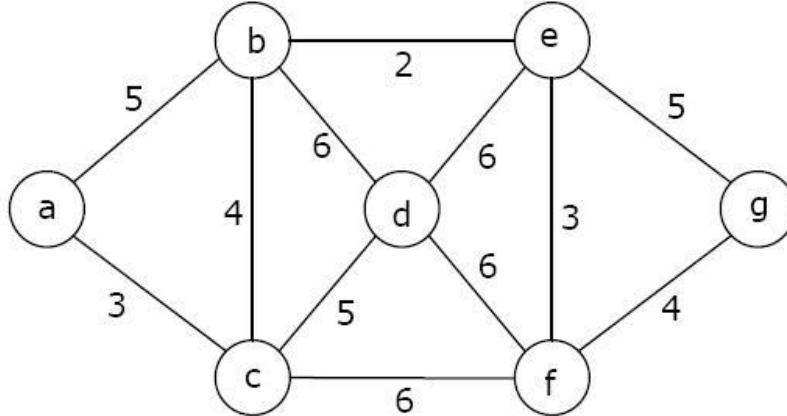
OR

8   Solve the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with the initial   **[14M]** conditions $a_0 = 2, a_1 = 7$ by Characteristics roots method

9   **A**   Define Euler and Hamiltonian graph with an example   **[7M]**
    B   Show that K_5 is non –planar graph   **[7M]**

OR

10   Explain Kruskal's algorithm and hence find a Minimum Spanning Tree   **[14M]**
            in the weighted graph shown in figure below

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Probability and Statistics
(CSE & IT)

Roll No									

Time: 3 hours   **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1   **A**   A Random variable X has the following Probability function :   **[7M]**

X	0	1	2	3	4	5	6	7
P(X)	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2 + K$

(i) Determine K (ii) Evaluate $P(X < 6)$, $P(X \geq 6)$, $P(0 < X < 5)$ and $P(0 \leq X \leq 4)$ (iii) $P(X \leq K) > 0.5$, find the minimum value of K and, (iv) Determine the distribution function of X (v) Mean (vi) Variance.

   B   The probability density f(x) of continuous R.V is given by f(x) = $ce^{-|x|}$,   **[7M]**
$-\infty < x < \infty$. Show that c $= \frac{1}{2}$ and find the mean and variance of the distribution. Also find the probability that the variance lies between 0 & 4.

OR

2   **A**   Let X denote the minimum of the two numbers that appear when a pair of   **[7M]**
fair dice is thrown once. Determine the (i) Discrete probability distribution (ii) Expectation (iii) Variance

   B   A continuous random variable has the probability density function   **[7M]**
$f(x) = \begin{cases} kx\, e^{-\lambda x} ; & x \geq 0; \lambda > 0; \\ 0; & otherwise \end{cases}$ Determine (i) k (ii) Mean (iii) Variance.

SECTION-II

3   **A**   Out of 800 families with 5 children each have. How many would you expect   **[7M]**
to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys and and (iv) atlest one boy

   B   In a normal distribution, 7% of items are under 35 and 89% are under 63.   **[7M]**
Determine the mean and variance of the distribution.

OR

4   **A**   2% of the items of a factory are defective. the items are packed in boxes.   **[7M]**
What is the probability that there will be i) 2 defective items ii) at least three defective items in a box of 100 items.

   B   Derive mean and variance of a Binomial distribution.   **[7M]**

SECTION-III

5   **A**   Ten competitors in a musical test were ranked by the three judges A, B&C in   **[7M]**
the following order

Ranks by A	1	6	5	10	3	2	4	9	7	8
Ranks by B	3	5	8	4	7	10	2	1	6	9
Ranks by C	6	4	9	8	1	2	3	10	5	7

Using rank correlation method, Compare which pair of judges has the nearest approach to common likings in music.

B   If $\sigma_x = \sigma_y = \sigma$ and the angle between the regression lines is $Tan^{-1}\left(\dfrac{4}{3}\right)$.   **[7M]**

Find correlation coefficient r.

<div align="center">OR</div>

6   **A**   Calculate the coefficient of Rank Correlation   **[7M]**

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

   B   Find the regression line of x on y and y on x for the following data   **[7M]**

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

SECTION-IV

7   **A**   If the population is 3, 6, 9, 15, 27 i) List all possible samples of size 3 that can be taken without replacement from the finite population. ii) Calculate the mean of each of the sampling distribution of means. iii) Find the standard deviation of sampling distribution of means   **[7M]**

   B   Write a note on Testing of Hypothesis   **[7M]**

8   **A**   Sample of size 2 are taken from the population 1,2,3,4,5,6 with replacement. Find (a) Mean of the population (b) Standard deviation of the population(c) The mean of the sampling distribution of the means (d) the standard deviation of the sampling distributions of means.   **[7M]**

   B   Among 100 fish caught in a large lake, 18 were inedible due to the pollution of the environment. With what confidence can we assert that the error of this estimate is at most 0.065?   **[7M]**

SECTION-V

9   **A**   In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned?   **[7M]**

   B   Two horses A and B were tested according to the time in seconds to run a particular race with the following results. Test whether you can discriminate between two horses.   **[7M]**

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

<div align="center">OR</div>

10   **A**   Among 900 people in a state 90 are found to be chapatti eaters. Construct 99% confidence interval for the true proportion.   **[7M]**

   B   The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.   **[7M]**

Unit-A	14.1	10.1	14.7	13.7
Unit-B	14.0	14.5	13.7	12.7

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, January 2024
Analog and Digital Electronics
(CSE & IT)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 **A** Explain V-I characteristics of PN junction diode and compare with ideal diode. **[7M]**

B Explain break down mechanisms in semiconductor diodes. **[7M]**

OR

2 **A** Define Reverse saturation current of a diode and how it depends on the Temperature during reverse bias. **[7M]**

B Explain equivalent circuit of diode . **[7M]**

SECTION-II

3 **A** Explain the operation of CB Configuration of BJT and its input and output Characteristics briefly. **[7M]**

B A transistor with α=0.97 has a reverse saturation current of 1μA in CB configuration. Calculate the value of leakage current in the CE configuration. Also find the collector current and the emitter current if the value of base current is 20μA. **[7M]**

OR

4 **A** Explain working of npn Transistor. **[7M]**

B Compare common base, common emitter and common collector configurations. **[7M]**

SECTION-III

5 **A** Convert the following i) $57.35_{(8)}$ to Binary ii) $57.35_{(8)}$ to Hexadecimal iii) $9BCD6_{(16)}$ to Octal **[6M]**

B Simplify the following Boolean functions to minimum number of literals: **[8M]**
     i. $F = X'Y' + XYZ + X'Y$
     ii. $F = X + Y[Z + (X+Z)']$.

OR

6 **A** Distinguish canonical and standard form. Convert Boolean expression in standard form $F=y'+xz'+xyz$ **[7M]**

B What are the advantages of 2's complement method ?Perform the subtraction of $10010_2 – 10011_2$ using 2's complement method **[7M]**

SECTION-IV

7 **A** Simplify using K map $F(A,B,C,D)=\Sigma m(7,8,9)+d(10,11,12,13,14,15)$ **[7M]**

B Simplify A'C'D' +AC' +BCD + A'CD' + A'BC +AB'C' **[7M]**

OR

8 **A** Simplify the following Boolean expressions using K-map and implement **[7M]**

them using NOR gates:

F (A, B, C, D) = AB'C' + AC + A'CD'

    B   Determine Prime implicants and essential prime implicants for the following **[7M]** function.

$F(w,x,y,z)=\Sigma m(8,12,13,18,19,21,22,24,25,28,30,31)+$
d(1,2,4,6,7,11,26)

SECTION-V

9	*A*	Explain the operation of full adder with neat diagram	**[7M]**
	B	With neat diagram explain the operation of JK Flip-flop .How Race-around Problem is eliminated	**[7M]**

OR

10	*A*	Design BCD to Gray code converter and realize using logic gates	**[7M]**
	B	Explain the operation of Multiplexer with neat diagram	**[7M]**

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