Hall Ticket No: | | | | | | | | | | |

Question Paper Code: 24MATP101

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R24) Regular End Semester Examinations, March - 2025

MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.No 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	(i). Assume that there is a 50% chance of hard drive damage if a power line to which a computer is connected is hit during an electrical storm. There is a 5% chance that an electrical storm will occur on any given summer day in a given area. If there is a 0.1% chance that the line will be hit during a storm, what is the probability that the line will be hit and there will be hard drive damage during the next electrical storm in this area	6M	1	3
	(ii). A drug is used to maintain a steady heart rate in patients who have suffered a mild heart attack. Let X denotes the number of heart beats per minute obtained per patient x: 40, 60, 68, 70, 72, 80, 100 f(x): 0.01, 0.04, 0.05, 0.80, 0.05, 0.04, 0.01 Find the average heartbeat of the patients and also find the variance of heart beats	6M	1	3
	OR			
Q.1(B)	A computer center has three printers A, B, and C, which print at different speeds. Programs are routed to the first available printer. The probability that a program is routed to printers A, B and C are 0.6, 0.3 and 0.1 respectively. Occasionally a printer will jam and destroy the printout. The probability that printers A, B and C will jam are 0.01, 0.05 and 0.04 respectively. Your program is destroyed when a printer jams. What is the probability that printer A is involved? Printer B involved? Printer C involved?	12M	1	3
Q.2(A)	(i) A factory produces light bulbs, and 90% of the light bulbs are good. A quality control inspector randomly selects 10 light bulbs for testing. (a)What is the probability that exactly 2 of the selected light bulbs are defective? (b)What is the probability that at least 1 of the selected light bulbs is defective? (c) What is the probability that no more than 3 defective light bulbs are found in the sample?	6M	2	3
	(ii)The average number of accidents on a certain national highway per day is 8. Assume that the number of accidents on any given day follows a Poisson distribution. Find the probability that on a particular day the number of accidents will be (a) at most 3 (b) at least 2 .	6M	2	3
	OR			
Q.2(B)	(i). Let X denote the time in hours needed to locate and correct the problem in the software that governs the timing of traffic lights in the down town area of a large city. Assume that X is normally distributed with mean 10 hours and variance 9. a) Find the probability that the next problem will require at most 15 hours to find and correct. b) The fastest 5% of repairs take at most how many hours to complete.	6M	2	3

	(ii) Let X be a gamma random variable with parameters α and β. Use the moment generating function to find $E[X], E[x^2]$.	6M	2	3
Q.3(A)	Determine if the formula is a tautology, a contradiction or a contingency. If you say that the formula is a contingency, give all valuations that satisfy the formula. (a) $((P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R)))$ (b) $((P \rightarrow Q) \rightarrow R)) \rightarrow (P \rightarrow (Q \rightarrow (P \rightarrow R)))$	12M	3	3
	OR			
Q.3(B)	Find a DNF and a CNF equivalent to the formula: ψ: $(((A \rightarrow \neg B) \vee (A \leftrightarrow C)) \rightarrow (\neg B \vee C))$.	12M	3	3
Q.4(A)	Two relations R and S from a set A containing four elements to a set B containing five elements are given in terms of their adjacency matrices: $M_R = \begin{bmatrix} 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix}; M_S = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$. Find the adjacency matrix of each of the relations R ∩ S, R ∪ S, R^{-1}, ¬R, S^{-1} and ¬S.	12M	4	3
	OR			
Q.4(B)	Define partial order relation. Let $D_{30} = \{1,2,3,5,6,10,15,30\}$ be the set of all divisors of 30 in N. Verify $(D_{30}, \mid)$ is a lattice and draw its Hasse diagram.	12M	4	3
Q.5(A)	Check whether the following graphs are isomorphic or not. Justify? i.  G H ii.  G H	12M	5	3
	OR			
Q.5(B)	Explain Hamiltonian circuits and Hamiltonian paths, Chromatic number, Trees, Traversal of trees with suitable examples	12M	5	3

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R24) Regular End Semester Examinations, March - 2025

DATABASE MANAGEMENT SYSTEMS

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.No 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	Explain the Architecture of Database management System with neat Diagram.	12M	1	2
	OR			
Q.1(B)	Explain the following: a) Entity set with example. b) Discuss the Applications of RDBMS.	12M	1	2
Q.2(A)	Consider the following relational schema Employee (Empno, name, office, age) Books (ISBN, Title, Authors, Publisher) Loan (Emp no, ISBN, date) Write the following queries in relational algebra. a. Find the names of employees who have borrowed a book Published by McGraw-Hill? b. Find the names of employees who have borrowed all books Published by McGraw-Hill? c. Find the names of employees who have borrowed more than five different books published by McGraw-Hill? d. For each publisher, find the names of employees who have borrowed?	12M	2	3
	OR			
Q.2(B)	Describe all the Key Constraints of RDBMS with Examples.	12M	2	3
Q.3(A)	Explain the following: a) What is BCNF? b) Explain how the modification anomalies are satisfied in BCNF?	12M	3	3
	OR			
Q.3(B)	Explain the following: a) Functional dependency b) Join dependency	12M	3	2
Q.4(A)	Explain the following: a) List and explain various types of specialized locking techniques used in DBMS. b) Explain two phase locking protocol	12M	4	2
	OR			
Q.4(B)	Explain ACID properties and States of a transaction in detail.	12M	4	3
Q.5(A)	Explain Various Types of Files associated with RDBMS with Example.	12M	5	3
	OR			
Q.5(B)	Differentiate the Static and Dynamic hashing.	12M	5	3

***** END*****

Hall Ticket No: | | | | | | | | | | |

Question Paper Code: 24MCAP102

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

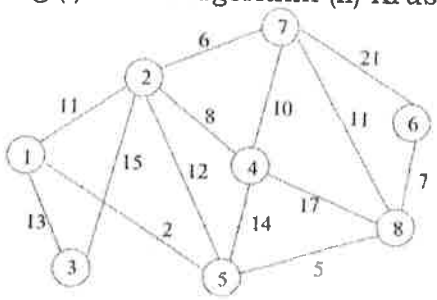
MCA I Year I Semester (R24) Regular End Semester Examinations, March - 2025

DATA STRUCTURES AND ALGORITHMS

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.No 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	What is Queue? Explain all Queue Operations with Example.	12M	1	3
	OR			
Q.1(B)	Describe the insertion and deletion of node at the end of singly Linked List with Diagram.	12M	1	4
Q.2(A)	Construct a binary search tree with the input given below: 98, 2, 48, 12, 56, 32, 4, 67, 23, 87, 55, 46 (i) Insert 21, 39, 45, 54, and 63 into the tree (ii) Delete values 23, 56, 2, and 45 from the tree	12M	2	3
	OR			
Q.2(B)	Define AVL Tree. Illustrate the insertion operations of AVL tree with keys: 21,26,30,9,4,14,28,18,15,10,2,3,7	12M	2	4
Q.3(A)	What is meant by asymptotic notations? How asymptotic notations are to calculate the time complexity of the algorithms.	12M	3	2
	OR			
Q.3(B)	Explain the master method for solving recurrence relation and find the time complexity of the following recurrence relations: (a) $T(n) = 2T(n/2) + n$ (b) $T(n) = 4T(n/2) + n^2$ (c) $T(n)=3T(n/4) + n \log n$	12M	3	2
Q.4(A)	Define Divide and conquer. Apply the Merge sort array arr[] = {18, 27, 45, 13, 2, 15, 82, 34,28,19,10,6,4}	12M	4	3
	OR			
Q.4(B)	Compute a minimum cost spanning tree for the following graph Using (i) Prim's algorithm (ii) Kruskal's algorithm.	12M	4	4



Q.5(A)	Solve the given 0/1 Knapsack problem using Branch and Bound technique. The Knapsack Capacity (m) = 15	12M	5	3

Item	1	2	3	4
weight	5	4	7	3
Value	50	32	15	52

OR

Q.5(B)	What do you understand by backtracking? Demonstrate the 4-Queens problem using backtracking.	12M	5	3

***** END*****

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Question Paper Code: 24MCAP103

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R24) Regular End Semester Examinations, March - 2025

PYTHON PROGRAMMING

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.No 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	Describe about type conversion functions with proper examples.	12M	1	2
	OR			
Q.1(B)	Write a Python program to find the sum of the individual digits of any given number.	12M	1	3
Q.2(A)	Why do we need functions in programming languages? Discuss the various types of user defined functions with examples.	12M	2	2
	OR			
Q.2(B)	Explain the string operations and functions with examples.	12M	2	2
Q.3(A)	Discuss the set operations and functions with examples.	12M	3	2
	OR			
Q.3(B)	Describe about array operations with suitable examples.	12M	3	2
Q.4(A)	Apply nested list comprehensions for matrix transpose operation.	12M	4	3
	OR			
Q.4(B)	Explain the file methods in Python with examples.	12M	4	2
Q.5(A)	Illustrate the SQL operations in Python.	12M	5	3
	OR			
Q.5(B)	How will you raise an exception, explain with examples.	12M	5	2

***** END*****

Hall Ticket No: | | | | | | | | | | |

Question Paper Code: 24MCAP104

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R24) Regular End Semester Examinations, March - 2025

OPERATING SYSTEMS

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.No 1 to 5 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1(A)	Explain different types of operating systems with examples.	12M	1	2
	OR			
Q.1(B)	Explain inter-process communication mechanisms along with its functions.	12M	1	2
Q.2(A)	Discuss about CPU scheduling and CPU Scheduling Criteria.	12M	2	2
	OR			
Q.2(B)	Describe Deadlocks Prevention, Deadlock Avoidance and Deadlock Detection in an operating system environment.	12M	2	2
Q.3(A)	Discuss the concept of virtual memory and demand paging.	12M	3	2
	OR			
Q.3(B)	What is paging? Explain the Allocation of Frames in paging technique.	12M	3	2
Q.4(A)	Explain various disk scheduling algorithms with examples.	12M	4	2
	OR			
Q.4(B)	Examine file system protection mechanism and their importance in operating system.	12M	4	3
Q.5(A)	Examine the architectural differences between Multiprocessor and Distributed Operating Systems and analyze their strengths and weaknesses in handling parallel and distributed tasks.	12M	5	4
	OR			
Q.5(B)	Differentiate RTOS and Distributed Operating System with real world examples.	12M	5	3

***** END*****