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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(Deemed to be University under Section 3 of UGC Act, 1956)

MCA I Year I Semester (R25) Supplementary End Semester Examinations - July 2026
COMPUTATIONAL MATHEMATICS

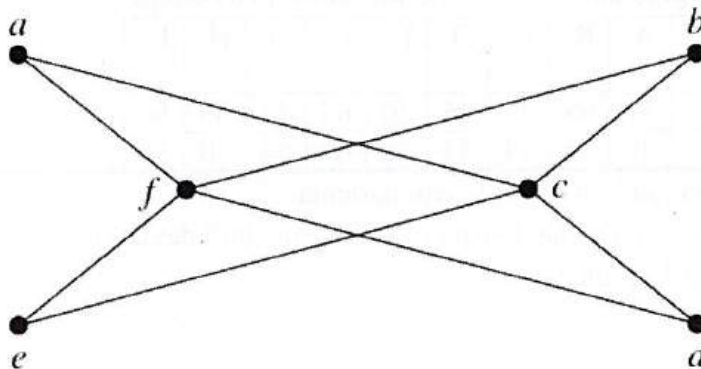
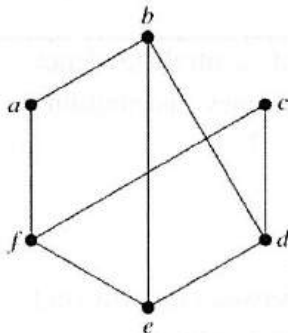
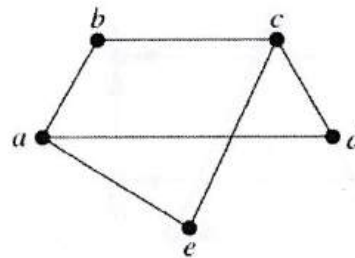
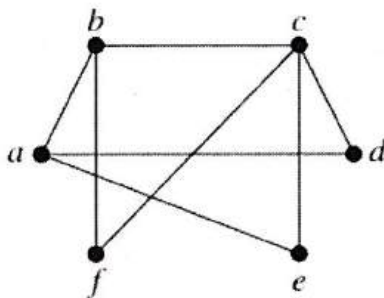
Time: 3Hrs

Max Marks: 100

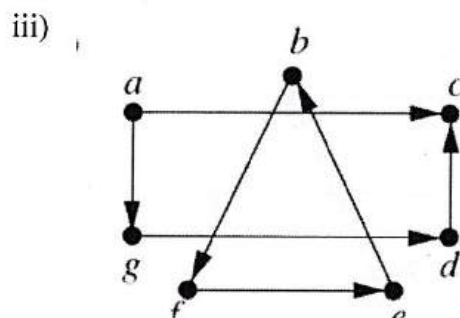
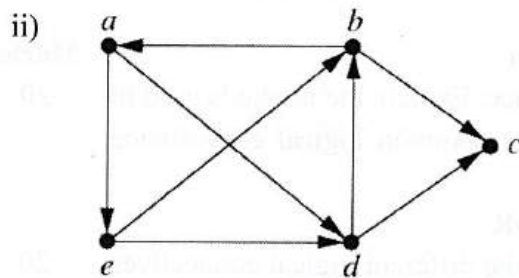
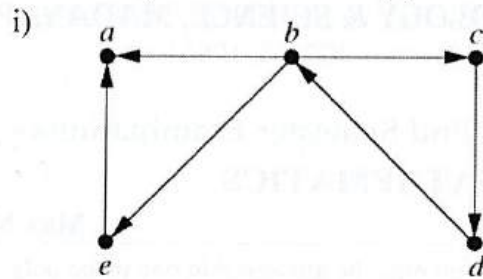
Attempt all the questions. All parts of the question must be answered in one place only.

In Q.no 1 to 5 answer either A or B only

Q.No.	Question	Marks	CO	BL
Q.1(A)	Discuss the concept of logical equivalence. Explain the methods used to prove logical equivalence and state the common logical equivalence laws with suitable expressions.	20	1	2
OR				
Q.1(B)	What are logical connectives? Explain the different logical connectives used in propositional logic with their truth tables and suitable examples.	20	1	2
Q.2(A)	Determine whether the following graphs are bipartite and explain how?	20	2	4

**OR**

Q.2(B) Determine whether each of the following graph is strongly connected or weakly connected. Justify your answer. 20 2 4



Q.3(A) Explain the concept and different measures of central tendency. 20 3 3
Calculate the arithmetic mean for the following frequency distribution,

X:	1	2	3	4	5	6	7
F:	5	9	12	17	14	10	6

OR

Q.3(B) Find out the Spearman's coefficient of correlation between the two kinds of assessments of graduate students' performance in a college 20 3 3

Name of Students	A	B	C	D	E	F	G	H	I
Internal Exam	51	68	73	46	50	65	47	38	60
External Exam	49	72	74	44	58	66	50	30	35

Q.4(A) Let X be a poisson random variable with parameter $\lambda=10$. 20 4 3

- Find the expression for the density of X and standard deviation of X.
- Find Mean and Variance
- $P(X \leq 4)$
- $P(X > 4)$
- $P(4 \leq X \leq 9)$

OR

Q.4(B)

Let X denote, the number of holes that can be drilled per bit. The density for X is given the following table:

x	1	2	3	4	5	6	7	8
$p(x)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	$p(8)$

- (i) Find $p(8)$
- (ii) Find the table for F
- (iii) Use F to find the probability that a randomly selected bit can be used to drill between three and five holes inclusive.
- (iv) Find $P(X \leq 4)$ and $P(X < 4)$. Are these same?

20 4 3

Q.5(A)

The mean weight of packets produced by a factory is 500 g with a standard deviation of 20 g.

20 5 3

- i) If a random sample of 36 packets is selected, find:
 - (a) the mean of the sampling distribution,
 - (b) the standard deviation (standard error) of the sampling distribution, and
 - (c) the probability that the sample mean lies between 495 g and 505 g.
- ii) Interpret the result obtained.

OR**Q.5(B)**

- i) Describe the Z-test, t-test and F-test used in hypothesis testing. What assumptions are required for each test? Write the corresponding test statistics.
- ii) Two machines produce items with variances 16 and 9 from samples of sizes 10 and 12. Test the equality of variances at 5% level of significance.

10 5 2

10 5 3

*****END*****

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MCA I Year I Semester (R25) Supplementary End Semester Examinations - July 2026**DATA STRUCTURES AND ALGORITHMS****Time: 3Hrs****Max Marks: 100**

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)	Discuss how arrays, stacks, queues, and linked lists together support expression processing in a compiler or interpreter pipeline, from storing tokens to converting and evaluating expressions.	20	1	4
OR				
Q.1(B)	Write the steps to evaluate a postfix expression using a stack, and trace the evaluation of the postfix expression $2\ 3\ 1\ * +\ 9\ -$.	20	1	3
Q.2(A)	Describe the basic idea of a splay tree. Explain how the splaying operation improves access time for frequently accessed nodes	20	2	1
OR				
Q.2(B)	Define a red-black tree. List the standard red-black properties and explain how these properties guarantee logarithmic height.	20	2	3
Q.3(A)	Describe the divide and conquer strategy? Explain the working strategy of Binary Search and find element 60 from the below set by using the above technique: {10, 20, 30, 40, 50, 60, and 70}. Analyze time complexity for binary search.	20	3	3
OR				
Q.3(B)	Explain the substitution method for recurrence relations. Solve $T(n)=2T(n/2)+n$ step-by-step using substitution to prove $T(n)=O(n\log n)$.	20	3	4
Q.4(A)	Explain merge sort and Arrange following elements in an ascending order using insertion sort: 15, 3, -1, -8, 10.	20	4	4
OR				
Q.4(B)	Explain Floyd-Warshall all-pairs shortest path algorithm. Analyze $O(V^3)$ dynamic programming via intermediate vertex matrix updates	20	4	2
Q.5(A)	Explain branch and bound bounding functions and Contrast DFS backtracking vs best-first search using priority queue on lower bounds.	20	5	4
OR				
Q.5(B)	Explain reducibility and State Cook's Theorem core idea: SAT is NP-Complete as every language in NP reduces to SAT via Turing machine simulation.	20	5	2

*****END*****

Hall Ticket No:

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Question Paper Code: 25MDMCAEC03

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MCA I Year I Semester (R25) Supplementary End Semester Examinations - July 2026**ADVANCED JAVA PROGRAMMING****Time: 3Hrs****Max Marks: 100**

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 Java Virtual Machine architecture and bytecode execution.	20	1	2
OR				
Q.1(B)	Describe control statements in Java with suitable examples.	20	1	3
Q.2(A)	Explain constructors and keywords this, super, static and final.	20	2	3
OR				
Q.2(B)	Differentiate early binding and late binding with examples.	20	2	4
Q.3(A)	Explain interfaces and multiple inheritance issues in Java.	20	3	4
OR				
Q.3(B)	Describe user-defined exceptions and with examples.	20	3	3
Q.4(A)	Explain synchronization and inter-thread communication.	20	4	4
OR				
Q.4(B)	Explain List, Set and Map interfaces with examples.	20	4	3
Q.5(A)	Explain Swing architecture and advantages over AWT.	20	5	3
OR				
Q.5(B)	Design a GUI using Swing components and event handling.	20	5	5

*****END*****

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MCA I Year I Semester (R25) Supplementary End Semester Examinations - July 2026**OPERATING SYSTEMS****Time: 3Hrs****Max Marks: 100**

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)	Analyze different types of operating systems like batch, time-sharing, distributed & real-time with their advantages and limitations.	20	1	4															
OR																			
Q.1(B)	Describe the FCFS scheduling algorithm. Calculate average waiting time for FCFS and SJF with Gantt chart for following data.	20	1	3															
	<table><tr><th>Process</th><th>Arrival Time</th><th>Time required for completion</th></tr><tr><td>P1</td><td>0</td><td>8</td></tr><tr><td>P2</td><td>1</td><td>4</td></tr><tr><td>P3</td><td>4</td><td>6</td></tr><tr><td>P4</td><td>6</td><td>2</td></tr></table>	Process	Arrival Time	Time required for completion	P1	0	8	P2	1	4	P3	4	6	P4	6	2			
Process	Arrival Time	Time required for completion																	
P1	0	8																	
P2	1	4																	
P3	4	6																	
P4	6	2																	
Q.2(A)	What is a Critical Section problem? Give the conditions that a solution to the critical section problem must satisfy.	20	2	2															
OR																			
Q.2(B)	Compute the number page faults for least recently used (LRU) and Optimal page replacement strategies for the given reference string 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2 with 3 page frames.	20	2	3															
Q.3(A)	Why is file protection required in an operating system? Discuss the need and explain the various file protection techniques employed.	20	3	2															
OR																			
Q.3(B)	Compare and analyze the FCFS and SSTF disk scheduling algorithms.	20	3	4															
Q.4(A)	Differentiate between Hard Real-Time and Soft Real-Time systems. Explain their requirements, constraints, and applications with suitable examples.	20	4	2															
OR																			
Q.4(B)	Explain the Earliest Deadline First (EDF) scheduling algorithm. Compare EDF with RMS in terms of schedulability and efficiency.	20	4	4															
Q.5(A)	i. Write the basic structure of a shell script and explain its components.	10	5	2															
	ii. Explain functions and user-defined commands in shell scripting. Discuss their advantages in script modularity.	10	5	2															
OR																			
Q.5(B)	i. Describe file permissions and access control in Unix/Linux.	10	5	2															
	ii. Write short notes on disk management in Linux.	10	5	2															

*****END*****

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MCA I Year I Semester (R25) Supplementary End Semester Examinations - July 2026

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Time: 3Hrs

Max Marks: 100

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	Explain the Architecture of Database management System with neat sketch.	10	1	2
ii	Analyze the two queries and answer the following: SELECT * FROM Sales WHERE YEAR(sale_date) = 2024; The DBA suggests rewriting it as: SELECT * FROM Sales WHERE sale_date BETWEEN '2024-01-01' AND '2024-12-31'; Explain why the first query performs slower compared to the second, in terms of function usage and index utilization	5	1	4
iii	Explain the Specialization with suitable example	5	1	2

OR

Q.1(B) i	Draw an E-R Diagram of employee salary database with neat sketch. Also explain types of association between the entities	20	1	5
Q.2(A) i	Explain the following relational algebra operation. JOIN, DIFFERENCE, SELECT, UNION	10	2	2
ii	Classify the different types of constraints used in DBMS and explain each with a suitable example.	10	2	3

OR

Q.2(B) i	Design and Construct an SQL query for the following table structure	20	2	4
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student_id	name	age	city	grade
1	Rahul	20	Delhi	A
2	Priya	17	Mumbai	B
3	Ankit	19	Delhi	B
4	Sneha	22	Chennai	A
5	Riya	21	Mumbai	A
6	Sameer	18	Delhi	C

- Write a SQL query to display the records of all students who belong to either Delhi or Mumbai and are older than 18 years
- Write a SQL query to enroll two new students into the students table in a single INSERT statement.
- Find the city with the maximum number of students having grade 'A'.
- Write a SQL query to display the number of characters in each student's first name, and alias that value as LengthFName

Q.3(A) i Explain the Normalization process and discuss its various forms (1NF, 2NF, 3NF, BCNF). 20 3 2

OR

Q.3(B) i Explain how B+ Trees improve search and retrieval efficiency in databases 10 3 5

ii Compare Primary Index, Secondary Index, and Clustering Index 10 3 4

Q.4(A) i Explain the two-phase locking protocol used for concurrency control. 10 4 2

ii Discuss the ACID properties of database transaction with suitable examples 10 4 4

OR

Q.4(B) i What is a Schedule? Compare serial and non-serial schedules with examples. 20 4 4

Q.5(A) i Explain procedures in PL/SQL with an example. 10 5 2

ii What is document based NOSQL systems? Explain the advantages of NoSQL over SQL. 10 5 2

OR

Q.5(B) i Explain Triggers in PL/SQL. Describe different types of triggers. 10 5 2

ii Explain while...loop statement in PL/SQL with an example 10 5 5

*****END*****