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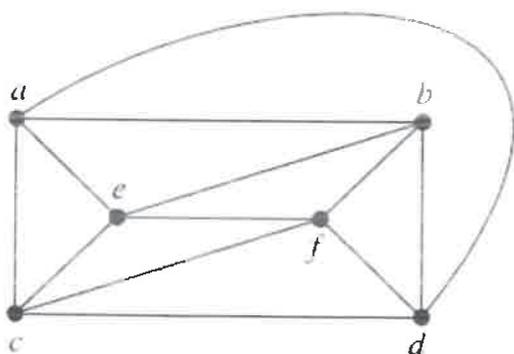
MCA I Year I Semester (R25) Regular End Semester Examinations - January 2026
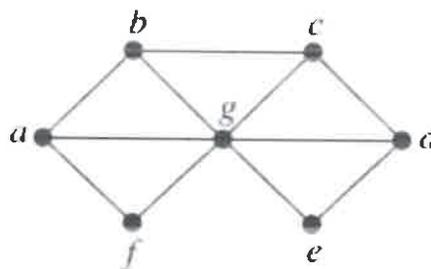## COMPUTATIONAL MATHEMATICS

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)	Construct a truth table for each of these compound propositions.	20	1	3
	i) $p \rightarrow .q$			
	ii) $.p \leftrightarrow q$			
	iii) $(p \rightarrow q) \vee (.p \rightarrow q)$			
	iv) $(p \rightarrow q) \wedge (.p \rightarrow q)$			
	v) $(p \leftrightarrow q) \vee (.p \leftrightarrow q)$			
	vi) $(.p \leftrightarrow .q) \leftrightarrow (p \leftrightarrow q)$			

OR

Q.1(B)	State the different rules of inference used in propositional logic. Explain each rule with a suitable example and demonstrate how these rules are applied in valid logical arguments.	20	1	2

Q.2(A)	i)	Explain the concepts of a graph and a subgraph. Explain the different types of graphs with neat diagrams.	10	2	2
	ii)	Distinguish between walk, trail, and path using an example graph.	10	2	2

OR

Q.2(B)	Analyze the given graph and determine its chromatic number. Illustrate one practical application of graph coloring.	20	2	4

Q.3(A)	i)	Ten patients at a doctor's surgery wait for the following lengths of times to see their doctor.	10	3	3

5 mins	17 mins	8 mins	2 mins	55 mins
9 mins	22 mins	11 mins	16 mins	5 mins

What are the mean, median and mode for these data? What measure of central tendency would you use here?

ii) Find the median wage of the following distribution:

Wages(in Rs.):	20-30	30-40	40-50	50-60	60-70		10	3	3
No.of labourers:	3	5	20	10	5				

Q.3(B)	Find the two regression equation of X on Y and Y on X from the following data:	20	3	3

X: 10   12   16   11   15   14   20   22
Y: 15   18   23   14   20   17   25   28

Q.4(A)	i)	A bank loan officer knows that 12% of the bank's mortgage holders lose their jobs and default on the loan in the course of 5 years. She also knows that 20% of the bank's mortgage holders lose their jobs during this period. Given that one of her mortgage holders just lost his job, what is the probability that he will now default on the loan?	10	4	3
	ii)	If X denotes the amount of radiation that can be absorbed by an individual before death ensues. Assume that X is normal with mean of 500 roentgens SD of 150 roentgens above what dosage level will only 5% of dosage exposed survive	10	4	3

Q.4(B)	As part of a drive to modernize the economy, the government of an eastern European country is pushing for starting 100 new projects in computer development and telecommunications. Two U.S. giants, IBM and AT&T, have signed contracts for these projects: 40 projects for IBM and 60 for AT&T. Of the IBM projects, 30 are in the computer area and 10 are in telecommunications; of the AT&T projects, 40 are in telecommunications and 20 are in computer areas. Given that a randomly chosen project is in telecommunications, what is the probability that it is undertaken by IBM?	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) Explain the concept of sampling distribution of the sample mean.
ii) 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,
(c) the probability that the sample mean lies between 495 g and 505 g.

Q.5(B)	In a certain city, the digits 0 to 9 appear in a telephone directory with the following frequencies:	20	5	4

Digit	0	1	2	3	4	5	6	7	8	9
Observed Frequency (O)	102	95	98	100	110	90	105	97	101	102

Test whether the digits may be taken to occur equally frequently at 5% level of significance.

END

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MCA I Year I Semester (R25) Regular End Semester Examinations - January 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	Compare and contrast the File System and Database System with suitable examples	10	1	3
	ii	Identify various data models used in DBMS with examples.	10	1	3
		OR			
Q.1(B)		Draw and explain an ER Diagram for a Hospital Management System.	20	1	5
Q.2(A)		Define Joins in SQL. Explain the different types of Joins with examples.	20	2	2
		OR			
Q.2(B)		Write and explain the syntax and use of CREATE, ALTER, DROP, and TRUNCATE commands in SQL.	20	2	3
Q.3(A)		Explain Static Hashing and Dynamic Hashing with examples.	20	3	2
		OR			
Q.3(B)		Explain different File Organization techniques used in databases.	20	3	2
Q.4(A)	i	Define Serializability. Explain Conflict Serializability with examples.	10	4	2
	ii	A banking transaction transfers money from one account to another. Using this scenario, explain how the ACID properties guarantee correctness and consistency of the transaction	10	4	5
		OR			
Q.4(B)		Explain Deadlocks in database systems. Discuss deadlock prevention, detection, and recovery techniques.	20	4	2
Q.5(A)	i	Explain Exception Handling in PL/SQL with types of exceptions (predefined and user-defined).	10	5	2
	ii	What are Cloud Databases? Explain their features, advantages.	10	5	2
		OR			
Q.5(B)		What is a Cursor? Explain Implicit and Explicit Cursors with suitable examples.	20	5	2

END

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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)		Write an algorithm to convert an infix expression to a postfix expression. Trace the algorithm to convert the infix expression '(a+b)*c/d+e/f' to a postfix expression.	20	1	3
		OR			
Q.1(B)	i.	Define an array. List any four limitations of arrays as a data structure and briefly explain how linked lists overcome these limitations and	10	1	2
	ii.	Describe with an example how to evaluate arithmetic expressions using stacks.	10		
Q.2(A)	i.	Define a binary tree and a binary search tree (BST). Explain any three differences between general binary tree and BST with suitable examples	10	2	3
	ii.	Explain the binary search tree operations (Insert, Delete) using suitable example.	10		2
		OR			
Q.2(B)		Consider the following list of numbers14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9,1 4, 5. Using these numbers construct an AVL Tree.	20	2	2
Q.3(A)		Define time complexity and space complexity of an algorithm. Explain the asymptotic analysis for time complexity.	20	3	2
		OR			
Q.3(B)		State the Master theorem and find the time complexity of the below recurrence relations using Master Theorem i) $T(n)=8T(n/2)+n^2$ ii) $T(n)=4T(n/2)+n^2$ iii) $T(n)=2T(n/2)+n$	20	3	3
Q.4(A)		Implement Merge Sort and explain the trace its steps for the following input. [34, 7, 23, 32, 5, 62, 25, 44, 55, 66, 87, 99, 22, 54]	20	4	3
		OR			
Q.4(B)	i.	State Dijkstra's algorithm for single-source shortest paths. Derive time complexity with binary heap $O((V+E) \log V)$ and limitations.	10	4	4
	ii.	State the PRIM's Algorithm for Minimum spanning tree.	10		3
Q.5(A)		Explain the N-queen problem using Branch and Bound technique	20	5	2
		OR			
Q.5(B)		Illustrate the terms P, NP, NP-Hard and NP-Complete. Also represent the relationship among these problems.	20	5	2

END

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MCA I Year I Semester (R25) Regular End Semester Examinations - January 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 the history of Java and features of Java language.	20	1	2
	OR			
Q.1(B)	Describe Java primitive data types and type casting with examples.	20	1	3
Q.2(A)	Explain classes and objects with suitable examples.	20	2	2
	OR			
Q.2(B)	Discuss polymorphism and its types in Java.	20	2	3
Q.3(A)	Explain exception handling mechanism with example programs.	20	3	3
	OR			
Q.3(B)	Describe packages and access protection levels in Java.	20	3	4
Q.4(A)	Explain thread life cycle and thread creation methods.	20	4	3
	OR			
Q.4(B)	Discuss Java Collection Framework hierarchy.	20	4	4
Q.5(A)	Explain AWT components and layout managers.	20	5	3
	OR			
Q.5(B)	Describe event delegation model with suitable example.	20	5	4

END

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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)		Describe the architecture of an operating system and explain in detail the role of each component.	20	1	2
		OR			
Q.1(B)		Explain Priority scheduling and Round Robin scheduling with suitable illustrations.	20	1	3
Q.2(A)		What is a deadlock? Give the conditions for deadlock. How can resource allocation graph be used for dead lock avoidance?	20	2	2
		OR			
Q.2(B)		Differentiate between External fragmentation and Internal fragmentation and explain how to solve the fragmentation problem using paging.	20	2	4
Q.3(A)		Explain the contiguous, linked, and indexed file allocation methods with neat diagrams.	20	3	2
		OR			
Q.3(B)		Compare various scheduling algorithms in terms of their performance and efficiency.	20	3	4
Q.4(A)		Explain the layered architecture of Mobile Operating Systems. Compare Android and iOS architectures with respect to real-time support.	20	4	2
		OR			
Q.4(B)		Describe inter-process communication (IPC) mechanisms used in RTOS. Explain how they support real-time constraints.	20	4	2
Q.5(A)	i.	Elaborate the features and uses of Bourne Shell and C Shell.	10	5	2
	ii.	Describe the control statements used in shell scripting.	10	5	2
		OR			
Q.5(B)	i.	Explain the use of *grep* and *awk* commands with examples.	10	5	2
	ii.	Write a script to count lines, words, and characters in a file.	10	5	3

END