

No. of Pages: 02

Roll No.....

A-1101

MCA I Semester Examinations (June 2026)
Introduction to Web Technology (MCA-101A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Differentiate between static and dynamic web pages.	2
(b) Write any two advantages of CSS in web development.	2
(c) What is the use of CSS selectors?	2
(d) Differentiate between iteration and recursion.	2
(e) What is XML HttpRequest?	2
(f) Differentiate between AJAX and traditional web applications.	2

UNIT-I

Q.2(a)	Design an HTML5 web page for a college event registration system using appropriate form and elements of your choice.	6
Q.2(b)	Explain the functions of web browsers and discuss the importance of web optimization techniques.	6
Q.3(a)	Explain different CSS properties related to borders, backgrounds, fonts, and text effects with suitable examples.	6
Q.3(b)	Discuss buffering and weblogs in web technologies.	6

UNIT-II

Q.4	Explain the Document Object Model (DOM) in JavaScript. Illustrate how DOM manipulation is used to dynamically modify webpage content. Write a JavaScript program to perform form validation for a login form containing username and password fields.	6+6
Q.5(a)	Explain array declaration, allocation, and passing arrays to functions in JavaScript.	6
Q.5(b)	Discuss the Window and document objects in JavaScript with suitable examples.	6

UNIT-III

Q.6(a)	Explain data types and flow control statements in PHP with examples.	6
Q.6(b)	Discuss basic security guidelines to be followed while developing PHP applications.	6
Q.7(a)	Explain cookies and sessions in PHP. Compare their working and applications in maintaining user state.	6
Q.7(b)	Write a PHP program to generate dynamic webpage content using loops and conditional statements.	6

UNIT-IV

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|---------------|---|-----------|
| Q.8 | Explain AJAX architecture and discuss the role of AJAX in modern web technologies with proper diagrams and taking some examples of your own choice. | 12 |
| Q.9(a) | Explain how PHP and AJAX work together to process client requests asynchronously. | 6 |
| Q.9(b) | Write some measures for developing a secure and accessible rich Internet application in AJAX. | 6 |

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Roll No.....

A-1102

MCA I Semester Examinations (June 2026)
Advanced Data Structures using C++ (MCA-103A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Define Abstract Data Type (ADT)	2
(b) What is the difference between linear and non-linear data structures?	2
(c) Define sparse matrix.	2
(d) What is recursion?	2
(e) Define AVL tree.	2
(f) What is hashing?	2

UNIT-I

Q.2(a) Compare Bubble Sort, Selection Sort, and Insertion Sort algorithms on the basis of the time and space complexity.	6
Q.2(b) Write a C++ program to perform Binary Search using recursive approach.	6
Q.3(a) How are arrays represented in memory? Discuss the operations performed on arrays.	6
Q.3(b) Compare Merge Sort and Radix Sort on the basis of working principle, complexity, and applications.	6

UNIT-II

Q.4(a) Explain different types of linked lists with suitable diagrams and applications.	6
Q.4(b) Write a C++ program to implement insertion and deletion operations in singly linked list.	6
Q.5(a) What is stack? Discuss the applications of stack with suitable examples.	6
Q.5(b) Write an algorithm to implement Circular Queue using arrays.	6

UNIT-III

Q.6(a) Explain traversal techniques of binary trees with suitable examples.	6
Q.6(b) Construct a Binary Search Tree (BST) for the elements: 50, 30, 70, 20, 40, 60, 80 and perform preorder, inorder, and postorder traversals.	6
Q.7(a) Differentiate between AVL Tree, B-Tree, and B+ Tree.	6
Q.7(b) Explain threaded binary trees and discuss their advantages over ordinary binary trees	6

UNIT-IV

Q.8(a) Explain the various graph traversal techniques with suitable examples.	6
Q.8(b) Why is Dijkstra's Algorithm used? Explain it with a suitable example.	6
Q.9 Explain Prim's and Kruskal's algorithms for Minimum Spanning Tree with suitable example.	12

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Roll No.: _____

A1103

MCA 1st Semester Examinations (June 2026)
Programming with Java (MCA-105A)

Time: 3 Hrs

Max. Marks: 60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

	Marks
Q.1	
(a) What is bytecode in Java?	2
(b) Describe the syntax of 'for' loop in Java.	2
(c) What is the use of 'super' keyword in Java?	2
(d) Discuss the role of an Abstract class in Java?	2
(e) Differentiate between a logical error and runtime error.	2
(f) Why JFrame class is used in Java?	2
UNIT-I	
Q.2(a) Explain relational operators in Java with examples.	7
Q.2(b) Write a program in Java to display the table of a given integer number using for loop.	5
Q.3(a) Write a Java program for the subtraction of two matrices.	7
Q.3(b) Write a Java program to search an item in an array of ten integer numbers.	5
UNIT-II	
Q.4(a) How multiple inheritance is implemented in Java? Give suitable example.	6
Q.4(b) Explain Method overloading in Java with example.	6
Q.5(a) Why packages are used in Java? Discuss important packages in Java.	4
Q.5(b) Differentiate Abstract class and Interface in Java with example.	8
UNIT-III	
Q.6(a) What is an Exception? How exceptions are handled in Java? Give an example of handling Arithmetic Exception of division by Zero.	9
Q.6(b) Discuss syntax error, logical error and runtime error.	3
Q.7(a) Describe Thread Priority. How the priority of a thread can be set and retrieved.	4
Q.7(b) Explain the life cycle process of a Thread in Java.	8
UNIT-IV	
Q.8(a) Explain the Delegation Event model in Java.	7
Q.8(b) Describe Flow Layout Manager in Java.	5
Q.9(a) Discuss the role of Connection and ResultSet in JDBC?	4
Q.9(b) Explain the steps required with suitable example for connecting and working with a backend database using JDBC.	8

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Roll No.....

A-1104

MCA I Semester Examinations (Jun 2026)

Operating System (MCA-107A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) What is the difference between SJF and SRTF? Explain with example.	2
(b) What are four necessary conditions for deadlock to occur?	2
(c) What is Process synchronization? Why is it required?	2
(d) What is Internal fragmentation? Explain with example.	2
(e) What are the different states that occur during the life time of a process?	2
(f) Differentiate between user management and group management. Give an example of changing group permissions.	2

UNIT-I

Q.2(a)	Given processes P1, P2, P3 with burst times 22, 13, 6 ms (arrival order P1→P2→P3). Calculate average waiting time and turnaround time using FCFS.	6
Q.2(b)	Differentiate between deadlock prevention and deadlock avoidance with examples.	6
Q.3	Given 3 processes and 3 resource types (A, B, C). Allocation matrix = $[[0,1,0],[2,2,0],[3,0,3]]$, Max matrix = $[[7,5,3],[3,4,2],[9,3,3]]$, Available = $[3,4,3]$. Apply Banker's Algorithm to check if the system is in a safe state.	12

UNIT-II

Q.4	A disk has 200 cylinders (0-199). The disk head is currently at cylinder 50. The pending requests in the queue are: 166, 22, 86, 50, 95, 180, 34, 119, 11, 123, 62, 64 Apply the following disk scheduling algorithms to determine the order of servicing requests and calculate the total head movement: 1. FCFS 2. SSTF 3. SCAN (moving towards higher cylinders first) 4. C-SCAN (moving towards higher cylinders first)	12
Q.5(a)	Given reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 with 4 page frames, trace step by step how LRU replaces pages and compute total page faults.	6
Q.5(b)	Using the reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5, calculate page faults for FIFO with 3 frames and 4 frames. Show if Belady's anomaly occurs.	6

UNIT-III

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|--------|---|---|
| Q.6(a) | Apply df and du to check disk usage of /home and explain the difference in their outputs. | 6 |
| Q.6(b) | Write a shell script that accepts a filename as input and displays whether the file exists or not. | 6 |
| Q.7(a) | Analyze the impact of loops (for, while) in shell scripts for automating repetitive administrative tasks. Provide examples. | 6 |
| Q.7(b) | Differentiate between Linux and Windows file systems in terms of directory structure and permissions. | 6 |

UNIT-IV

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|--------|--|---|
| Q.8(a) | Differentiate between scheduling tasks with “cron” and “at”. Which is more effective and when? | 6 |
| Q.8(b) | Compare symbolic (chmod u+x) and numeric (chmod 755) methods of changing permissions. Which is easier to analyze in large systems? | 6 |
| Q.9(a) | Analyze the difference between ifconfig and ip command for configuring network interfaces. | 6 |
| Q.9(b) | Evaluate the effectiveness of “tar” versus “rsync” for backup and restore operations. | 6 |

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Roll No:

A-1121
MCA I Semester Examinations (June 2026)
Programming in C (MCA-11A)

Time- 3hrs
Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory.
Each Question carries 12 marks.

Q.1	Marks
(a) What is a flowchart? Name any two flowchart symbols with diagram.	2
(b) Define keywords and identifiers with one example each.	2
(c) Write any two differences between while and do-while loops.	2
(d) What is a library function? Give any two examples from <string.h>.	2
(e) Define pointer to a function.	2
(f) What is the difference between text files and binary files?	2

UNIT-I

Q.2(a) Explain the compilation and execution process of a C program with a neat diagram.	6
Q.2(b) Discuss various types of constants in C with examples.	6
Q.3(a) Write an algorithm and pseudocode to compute the roots of a quadratic equation.	6
Q.3(b) Explain bitwise operators with suitable examples.	6

UNIT-II

Q.4(a) Write a C program to check whether a number is prime or not using a loop.	6
Q.4(b) Explain recursion. Write a recursive function to generate the Fibonacci series.	6
Q.5(a) Explain nested if statements with a proper example program.	6
Q.5(b) Discuss different types of user-defined functions with suitable examples.	6

UNIT-III

Q.6(a) Explain two-dimensional arrays. Write a program to find the product of each row of a 3×3 matrix.	7
Q.6(b) Write a program to search for an element in an array using linear search.	5
Q.7(a) Explain strcpy(), strcat(), strcmp() and strlen() with examples.	6
Q.7(b) Explain pointer arithmetic. Write a small program to demonstrate incrementing a pointer.	6

UNIT-IV

Q.8(a) Explain nested structures with an example.	6
Q.8(b) Discuss malloc(), realloc() and free() with suitable examples.	6
Q.9(a) Write a C program to write student records (roll number and marks) to a file using fprintf().	6
Q.9(b) Explain fscanf(), fread(), and fwrite() functions with examples.	6

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Roll No.....

B-1101

MCA II Semester Examinations (Jun 2026)

Programming with Python (MCA-102A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Explain the significance of dynamic typing in Python with an example.	2
(b) Differentiate between == and is operators in Python.	2
(c) What will be the output of the expression list(range(2,10,2))?	2
(d) Why are tuples considered more secure than lists in Python?	2
(e) What is the role of the with keyword in file handling?	2
(f) Distinguish between compile-time and run-time exceptions in Python.	2

UNIT-I

Q.2(a)	Python is considered both an interpreted and object-oriented language. Justify the statement.	6
Q.2(b)	Explain short-circuit evaluation in logical operators with suitable examples	6
Q.3(a)	Develop a Python program to determine whether a given number is an Armstrong number or not.	6
Q.3(b)	Compare for and while loops in Python with respect to syntax, and execution control.	

UNIT-II

Q.4(a)	Analyze the similarities and differences among Strings, Lists, and Tuples with respect to mutability, memory usage, and operations supported.	6
Q.4(b)	Write a Python program to perform insertion, deletion, traversal, and slicing operations on a list.	6
Q.5(a)	Discuss how Sets can be effectively used in solving problems involving union, intersection, and difference operations. Illustrate with examples.	6
Q.5(b)	Design a dictionary-based Python program to maintain student records containing roll number, name, and marks, and explain how dictionary methods facilitate efficient data retrieval.	6

UNIT-III

Q.6(a)	Explain the concept of variable scope in Python with suitable examples. How does Python resolve conflicts between local and global variables?	6
Q.6(b)	Discuss the advantages of recursive and lambda functions in Python. Develop suitable examples to illustrate their practical applications.	6

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|---------------|---|----------|
| Q.7(a) | Explain the need for packages in Python. Discuss the procedure for creating user-defined packages and importing modules from them. | 6 |
| Q.7(b) | Develop a Python program to read data from a text file and write selected contents into another file using appropriate file handling techniques. Explain the significance of seek() and tell() functions in this context. | 6 |

UNIT-IV

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|---------------|--|----------|
| Q.8(a) | Explain how inheritance promotes code reusability in Python. Differentiate between single inheritance and multiple inheritance with suitable examples. | 6 |
| Q.8(b) | Develop a Python class for employee management incorporating constructor, destructor, and method overriding concepts. | 6 |
| Q.9(a) | Discuss the exception handling in Python. How do try-except-else-finally blocks improve program reliability? | 6 |
| Q.9(b) | Explain the architecture of SQLite database connectivity in Python. Write the steps involved in creating a table, inserting records, and retrieving data using the sqlite3 module. | 6 |

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Roll No.....

B-1102

MCA II Semester Examinations (Jun 2026)
Computer Networks and Data Communications (MCA-104A)

Time- 3hrs
Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Define computer network. Write any two advantages of computer networks.	2
(b)	What is a protocol? Differentiate between connection-oriented and connectionless services.	2
(c)	Differentiate between IPv4 and IPv6 addressing with examples.	2
(d)	What is CRC? Explain how it is used for error detection.	2
(e)	What is Manchester encoding? Mention one advantage of it.	2
(f)	Define DNS and explain its significance in the application layer.	2

UNIT-I

Q.2	Explain the different types of network topologies (Star, Bus, Ring, Tree, Mesh, Hybrid) with their advantages and disadvantages.	12
Q.3	Describe the OSI reference model in detail. Explain services and protocols at each layer. Also compare OSI and TCP/IP models.	12

UNIT-II

Q.4	Explain IEEE 802 standards for LAN. Discuss Ethernet, Token Ring, and peer-to-peer networks in detail.	12
Q.5(a)	Explain flow control and error control mechanisms used in the data link layer.	6
Q.5(b)	Discuss CSMA/CD and CSMA/CA protocols. Also explain where these protocols are commonly used.	6

UNIT-III

Q.6	Explain switching techniques and routing in the network layer. Discuss static, dynamic, and hybrid routing with examples.	12
Q.7(a)	Compare Distance Vector Routing and Link State Routing algorithms.	6
Q.7(b)	Explain TCP in detail: connection establishment, flow control, congestion control, and error control mechanisms.	6

UNIT-IV

Q.8	Explain the working and purpose of DNS, HTTP, HTTPS, FTP, TELNET, and SSH protocols at the application layer.	12
Q.9	Explain SDMA, FDMA, TDMA, and CDMA multiple access techniques for wireless communication.	12

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Roll No.....

B-1103

MCA II Semester Examinations (Jun 2026)

Advanced Data Base Systems (MCA-106A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Define DBMS and explain any two characteristics of DBMS.	2
(b)	Differentiate between specialization and generalization in EER model.	2
(c)	What is normalization? Why is it required in databases?	2
(d)	Write any two differences between DDL and DML commands.	2
(e)	Define serializability in transaction processing.	2
(f)	Define NoSQL database?	2

UNIT-I

Q.2(a)	Explain the 3-tier architecture of DBMS with neat diagram. Discuss its advantages over 2-tier architecture.	6
Q.2(b)	Construct an ER diagram for a Library Management System showing entities, attributes, relationships and cardinality constraints.	6
Q.3	Explain the Enhanced Entity Relationship (EER) model. Discuss specialization, generalization, aggregation and attribute inheritance with suitable examples.	12

UNIT-II

Q.4	Explain functional dependencies and normalization. Convert the following relation into suitable normal forms up to BCNF with proper justification: R(Student_ID, Student_Name, Course_ID, Course_Name, Faculty_Name, Faculty_Room)	12
Q.5(a)	Explain different types of SQL commands with suitable examples.	6
Q.5(b)	Write SQL queries for the following: 1. Display employee names with salary greater than 70000. 2. Find department-wise average salary using GROUP BY clause. 3. Create a view for employee details of IT department.	6

UNIT-III

Q.6	Explain transaction processing in DBMS. Discuss ACID properties, concurrent execution of transactions and conflict serializability with suitable examples.	12
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|---------------|---|----------|
| Q.7(a) | Explain lock-based protocols and timestamp-based protocols used for concurrency control. | 6 |
| Q.7(b) | Discuss backup and recovery techniques in DBMS. Explain the role of GRANT and REVOKE commands in database security. | 6 |

UNIT-IV

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|---------------|--|-----------|
| Q.8 | What are NoSQL databases? Compare relational databases with NoSQL databases. Explain different categories of NoSQL databases with suitable examples. | 12 |
| Q.9(a) | Explain the architecture and features of MongoDB. | 6 |
| Q.9(b) | Differentiate between Key-Value stores, Wide Column stores and Graph databases with suitable applications. | 6 |

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Roll No.....

B-1104
MCA II Semester Examinations (Jun 2026)
Software Engineering (MCA-110A)

Time- 3hrs
Max.Marks-60

Attempt 5 questions in all, selecting one question from each unit and Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Define software engineering.	(2)
(b)	List any four characteristics of software.	(2)
(c)	What are functional requirements?	(2)
(d)	What is the purpose of an SRS document?	(2)
(e)	What is unit testing?	(2)
(f)	Define software project management.	(2)
UNIT-I		
Q.2(a)	Explain software crisis. How does software engineering help in solving software crisis?	(6)
Q.2(b)	Explain software processes and their importance in developing quality software.	(6)
Q.3	Explain Spiral Model in detail. How is it different from other software life cycle models?	(12)
UNIT-II		
Q.4	What is requirement elicitation? Explain interview, brainstorming, Quality Function Deployment, and use case approach as requirement elicitation techniques.	(12)
Q.5(a)	Explain SRS. Discuss the characteristics of a good SRS document.	(6)
Q.5(b)	Explain Data Flow Diagram and its components with a suitable example.	(6)
UNIT-III		
Q.6	Explain different design methodologies. Compare function-oriented design and object-oriented design with suitable examples.	(12)
Q.7(a)	Explain cohesion and its types. Why is high cohesion preferred?	(6)
Q.7(b)	Differentiate between error, fault, and failure with suitable examples.	(6)
UNIT-IV		
Q.8	Explain software project management. Discuss why planning, scheduling, monitoring, and control are important in software projects.	(12)
Q.9(a)	Explain COCOMO model and its role in effort and cost estimation.	(6)
Q.9(b)	Discuss the responsibilities of a software project manager.	(6)

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Roll No.....

B-1105

MCA II Semester Examinations (Jun 2026)
Design Thinking and Innovation (BT-ME-112A)

Time- 3hrs
Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory. Each Question carries 12 marks.

	Marks
Q.1	
(a) Differentiate between creativity, innovation and invention.	2
(b) Define lateral thinking.	2
(c) Define Customer Journey Map.	2
(d) What is brainstorming?	2
(e) What is SCAMPER technique?	2
(f) What is a prototype?	2
UNIT-I	
Q.2 Describe the key features of the Design Thinking process. How does it support innovation? Also, discuss its importance in modern problem-solving.	12
Q.3 (a) Differentiate between Design Thinking and Traditional Thinking with suitable examples.	6
(b) Explain the Design Thinking framework and discuss the five modes in detail	6
UNIT-II	
Q.4(a) Explain the role of empathy in Design Thinking. How do empathy maps help in understanding users?	6
(b) Discuss various methods used for creating empathy maps	6
Q.5 Explain Customer Journey Mapping and Personas as empathy tools with examples.	12
UNIT-III	
Q.6 Explain the challenges faced during idea generation. How can they be overcome? Also, explain various ideation tools.	12
Q.7(a) Explain Lateral Thinking and its role in generating innovative ideas.	6
Q.7(b) Describe Six Thinking Hats and its application in group ideation activities.	6
UNIT-IV	
Q.8(a) What is a prototype? Explain prototyping as a mindset with suitable examples.	6
(b) Explain the process of testing prototypes with users and its importance.	6
Q.9 Describe how to create a pitch plan and roadmap for implementation of a design project. Explain with suitable example.	12

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Roll No.....

C-1101

MCA III Semester Examinations (June 2026)
Data Mining & Integration using R (MCA-201A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) What are Outliers? Explain distance-based methods for outlier detection.	2
(b) Define Association Rule Mining	2
(c) Define Schema Matching and discuss the major challenges associated with schema heterogeneity.	2
(d) Name any two clustering functions available in R.	2
(e) What is the purpose of the getwd() function in R?	2
(f) Explain support and confidence measures with examples.	2

UNIT-I

Q.2(a)	Differentiate between Operational Database Systems and Data Warehouse Systems with suitable examples.	6
Q.2(b)	Discuss the three-tier architecture of a Data Warehouse and explain the role of each layer.	6
Q.3(a)	Discuss the significance of Data Warehousing in strategic decision-making and business intelligence.	6
Q.3(b)	Describe the complete Knowledge Discovery in Databases (KDD) process with a suitable diagram.	6

UNIT-II

Q.4(a)	Define Cluster Analysis. Explain the objectives and applications of clustering in Data Mining.	6
Q.4(b)	Describe Hierarchical Clustering methods. Differentiate between agglomerative and divisive approaches	6
Q.5(a)	Discuss following Attribute Selection Measures used in Decision Trees: Information Gain, Gain Ratio, and Gini Index.	6
Q.5(b)	Discuss the concept and applications of Market Basket Analysis in business decision-making.	6

UNIT-III

Q.6(a)	Define Data Integration and explain its importance in heterogeneous database environments.	6
Q.6(b)	Explain the challenges involved in integrating data from multiple autonomous data sources.	6
Q.7(a)	Explain the Global-as-View approach in Schema Mapping with suitable examples.	6

- Q.7(b)** Explain set-based similarity measures such as Jaccard Coefficient and Cosine Similarity. **6**

UNIT-IV

- Q.8(a)** Explain the concept of Decision Trees in Data Mining. Discuss the implementation of Decision Tree algorithms in R using appropriate packages. **6**
- Q.8(b)** Describe various data types and data structures available in R with suitable examples. **6**
- Q.9(a)** What is a Data Frame in R? Explain its creation, manipulation, and applications in Data Mining. **6**
- Q.9(b)** Discuss methods for Data Integration and Data Import in R from external data sources. **6**

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Roll No.....

C-1102

MCA III Semester Examinations (Jun 2026)

AI and Machine Learning (MCA-203A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1		Marks
(a)	Explain the optimality property of search algorithms.	2
(b)	State Naive Bayes theorem.	2
(c)	List and explain any two real life applications of machine learning.	2
(d)	Explain the bias-variance trade-off.	2
(e)	Why can't linear regression be used for classification? Explain with the help of an example.	2
(f)	State two parameters used in density-based clustering.	2
UNIT-I		
Q.2(a)	Explain the working of the A* algorithm and discuss its properties of admissibility and monotonicity.	8
Q.2(b)	Exemplify any two heuristics used with AI problems and compare their effect on goal-search.	4
Q.3(a)	Compare BFS, DFS and Hill Climbing algorithms in terms of procedure, performance and complexity. Categorize these algorithms as guided or unguided. List two advantages of guided search over unguided search.	8
Q.3(b)	Discuss the historical background and evolution of Artificial Intelligence.	4
UNIT-II		
Q.4	Define machine learning. What are the objectives of machine learning? Explain in detail different Machine Learning (ML) tasks. State three real-world applications of machine learning involving different ML tasks.	12
Q.5(a)	Explain the working process, tree construction method and splitting criteria of CART (Classification and Regression Tree) algorithm with suitable examples. Also state its advantages and limitations.	8
Q.5(b)	Compare supervised and unsupervised learning. State two applications of each.	4
UNIT-III		
Q.6(a)	Define Support Vector Machines (SVM) and explain how they classify data. Discuss the importance of the kernel trick in SVM and discuss two example problems effected with choice of kernel function.	8
Q.6(b)	Justify how k-NN performs classification without pre-building a learning model.	4
Q.7(a)	Explain any two metrics for Model Evaluation. Suppose there are two models M1 and M2.	8

For M1: TP = 6954, FN=46, FP=412, and TN=2588

For M2: TP = 6800, FN= 134, FP=566, and TN=2500

Calculate accuracy, recall, specificity and sensitivity for the given models.

Compare the performance of M1 and M2 and justify your answer.

- Q.7(b) Compare Naïve bayes and decision tree classification algorithms with their advantages and limitations. 4

UNIT-IV

- Q.8(a) Explain hierarchical clustering in detail with a suitable example and diagram(s). How single linkage and complete linkage differ in case of agglomerative hierarchical clustering? 8
- Q.8(b) Discuss types of clusters (any three types) and mention one clustering algorithm(s) associated with each type. 4
- Q.9(a) Compare and contrast K-means, density based and expectation maximization clustering. 8
- Q.9(b) Explain any two cluster evaluation methods. 4

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Roll No.....

C-1103

MCA III Semester Examinations (Jun 2026)
Human Values and Ethics (ASH-HUM-127A)

Time- 3hrs
Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Write short answers	Marks
(a)	Define basic human aspiration.	2
(b)	Differentiate between Right Understanding and Resolution.	2
(c)	Define the terms knower, known, and process of knowing.	2
(d)	State any two reasons for contradiction in the self.	2
(e)	How does a holistic way of living lead to harmony.	2
(f)	Why is human conduct important for society?	2
UNIT-I		
Q.2(a)	Apply the concept of resolution to solve problems arising due to stress and competition.	6
Q.2(b)	Show how self-exploration can improve decision-making in human life.	6
Q.3	Apply the idea of all-encompassing resolution in solving problems related to family, society, and environment.	12
UNIT-II		
Q.4	Examine the relationship between basic human aspirations and their fulfillment through right understanding and resolution. Discuss how the activities of the Self contribute to achieving lasting happiness and harmony in human life. Support your answer with suitable examples.	12
Q.5(a)	Explain the role of human conduct in maintaining harmony in existence.	6
Q.5(b)	"Human being is the co-existence of the Self and the Body." Elaborate this statement with suitable examples.	6
UNIT-III		
Q.6	Discuss the need and process of inner evolution through self-exploration, self-awareness, and self-evaluation.	12
Q.7(a)	Discuss the need for inner evolution in human beings.	6
Q.7(b)	Discuss the importance of harmony in nature for sustainable living.	6
UNIT-IV		
Q.8	Discuss how comprehensive understanding of existence leads to a humane society. Propose a practical framework to achieve harmony from self to the entire existence.	12

- Q.9(a)** Discuss the importance of right thought and behavior in maintaining social harmony. 6
- Q.9(b)** Explain the role of holistic understanding in resolving conflicts in human life. 6

No. of Pages- 02

Roll No.....

C-1105

MCA III Semester Examinations (Jun 2026)
Data Analysis and Visualization using Python (MCA-253A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) What is the use of zeros(), ones() function in numpy?	2
(b) What is the use of hstack(), vstack() function in numpy?	2
(c) What type of data sources can be loaded as pandas DataFrame?	2
(d) What is the role of p-value in hypothesis testing?	2
(e) Discuss the use of pandas date_range() function with start, periods, and freq parameters.	2
(f) Describe 'trend' in time series data?	2

UNIT-I

Q.2(a)	Let 'A' be a numpy array of [10 11 12 13 14 15 16 17 18 19 20] values. the output of the following statements (i) A[1 : 4] (ii) A[-5 : -2] (iii) A[-3 :] (iv) A[0 : 3 : 2] (v) A[-2 : -5 : -1] (vi) A[:-1]	6
Q.2(b)	The sales data of a store in a week is given as: sales_data=[500, 600, 700, 800, 750, 900] Perform the following operations: i) Create a Series for the sales_data with custom indexes as week days name. ii) Discuss the use of 'index' and 'values' keywords with Series iii) Slice multiple elements from the Series iii) Add a constant value (50) to all elements of the Series iv) Filter out all values which are > 700	6
Q.3 (a)	Let 'A' be a numpy array of [5, 3, 1, 6, 8, 7, 2, 9, 4] values. Discuss the use of following functions. i) sum() ii) max() iii) min(), iv) argmax() v) argmin()	6
Q.3 (b)	Explain and apply sort_values() and reset_index() function in pandas Series with example.	6

UNIT-II

Q.4	What is a Bar chart and Pie Chart? Plot a Bar and Pie chart using matplotlib for the given sample data branches=['CSE','ECE','IT','EE'] strength=[15,30,25,10] colors=['gold', 'yellowgreen', 'lightskyblue', 'blue'] (a)Set figure size, title, x and y labels and branches as xticks with rotation as 45 degree. (b)Explode the 'CSE' pie as 0.1 and starting angle as 45 degree.	12
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- Q.5(a) Write a Python program to load a CSV dataset and display: 6
- first 5 rows,
 - column names,
 - and dataset information.
- Q.5(b) Explain data manipulation techniques in Pandas with suitable examples. 6

UNIT-III

- Q.6 Describe the Correlation analysis. Evaluate the correlation of Hours_Studied and Exam_Score from the given data using Numpy **corrcoef()** function. 12
- ```
data = {
 'Hours_Studied': [1, 2, 3, 4, 5, 6, 7],
 'Exam_Score': [40, 45, 50, 55, 60, 65, 70]
}
```
- Q.7(a) Explain the statistical functions mean, median, and mode with suitable examples using pandas or numpy. 6
- Q.7(b) Explain Chi-square test analysis for hypothesis testing with suitable example. 6

### UNIT-IV

- Q.8 What is Time series data? Explain the key characteristics and uses of time series data. Also explain autocorrelation in time series data. 12
- Q.9(a) Describe resampling of time series data. Perform down-sampling and up-sampling of the following time series data using pandas resample () method. 6
- ```
dates = pd.date_range('2025-01-01', periods=10, freq='D')
values = [10, 12, 13, 15, 20, 18, 22, 21, 19, 25]
data = pd.Series(values, index=dates)
```
- Q.9(b) Explain the use of now(), date(), time(), timedelta() function of 'datetime' library. 6

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Roll No.....

D-1101

MCA IV Semester Examinations (Jun 2026)

Big Data Analytics (MCA-202A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Compulsory Question:	Marks
(a)	Brief the concept of data variety, data velocity and data volume in Big Data with examples.	2
(b)	What role does Information and Communication Technology (ICT) play in managing Big Data?	2
(c)	What are the key objectives of Data Governance in Big Data environments?	2
(d)	Write the role of mapper and reducer class in Map Reduce?	2
(e)	Critically analyze NoSQL misconceptions.	2
(f)	Brief the role of distance function in the Nearest Neighbourhood.	2

UNIT-I

Q.2(a)	Explain different categories of data (human-generated vs machine-generated, qualitative vs quantitative). Discuss their significance in Big Data analytics.	6
Q.2(b)	Describe the Big Data Analytics Lifecycle in detail. Explain each phase with suitable examples and challenges involved.	6
Q.3(a)	Discuss the major business drivers for Big Data adoption. How does Big Data improve decision-making and operational efficiency?	6
Q.3(b)	Analyze real-world industry applications of Big Data in areas such as e-commerce, banking, telecommunications, and government. Highlight opportunities and limitations.	6

UNIT-II

Q.4(a)	Explain the concept of Big Data Oversight. Discuss governance frameworks and policies required for effective oversight.	6
Q.4(b)	Discuss various Big Data tools and techniques including HIVE, Pig and Zookeeper. Explain how they ensure coordination and resource management.	6
Q.5(a)	Describe the process of developing Big Data applications. Explain tools, frameworks, and challenges involved.	6
Q.5(b)	Analyze causes of failure in Big Data projects. Discuss issues related to lack of standards and legal constraints with suitable examples.	6

UNIT-III

- | | | |
|--------|---|----|
| Q.6(a) | Explain different NoSQL storage types such as key-value and graph databases with suitable examples. | 6 |
| Q.6(b) | Discuss the features of MongoDB. Explain how it handles large-scale data efficiently. | 6 |
| Q.7 | Explain common misconceptions about NoSQL databases. Compare NoSQL with RDBMS and justify when NoSQL should be preferred. | 12 |

UNIT-IV

- | | | |
|--------|---|---|
| Q.8(a) | Discuss various pattern recognition paradigms and approaches. Compare statistical, syntactic, and neural approaches. | 6 |
| Q.8(b) | Explain feature extraction and feature reduction techniques in detail. Discuss their role in improving classification performance. | 6 |
| Q.9(a) | Explain the concept of data domain in pattern recognition. Discuss different types of data and their influence on pattern recognition models. | 6 |
| Q.9(b) | Explain the working of the Nearest Neighbour Classifier with a suitable example. Also, discuss its advantages and limitations. | 6 |

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Roll No.....

D-1102

MCA IV Semester Examinations (Jun 2026)
Advanced Design and Analysis of Algorithms (MCA-204A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Define Big-O notation.	2
(b) Solve recurrence using the Master Theorem: $T(n)=2T(2n)+n$.	2
(c) What is a flow network?	2
(d) Give one example of a problem in P.	2
(e) Define bitonic sequence.	2
(f) What is meant by the depth of a sorting network?	2

UNIT-I

Q.2(a)	Explain NP-completeness and describe the steps to prove that a problem is NP-complete.	6
Q.2(b)	Compare deterministic and non-deterministic computation models.	6
Q.3(a)	Explain polynomial-time verification and its importance in NP problems.	6
Q.3(b)	Solve $T(n)=T(n/2)+n$ using the Recursion Tree method.	6

UNIT-II

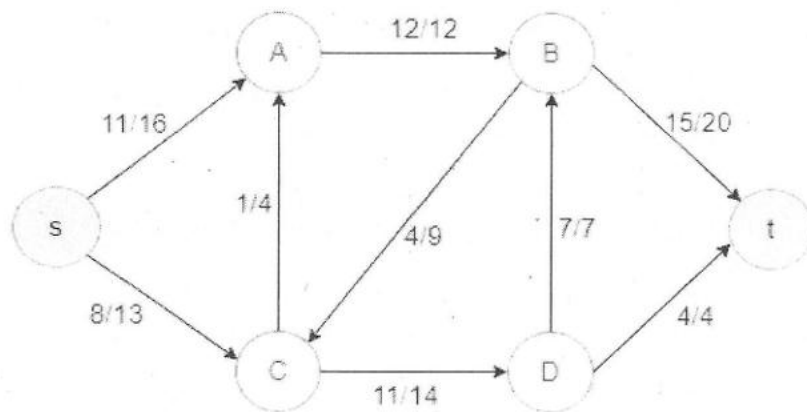
Q.4	Write technical notes on the following:	2X6=12
	i. Activity Selection problem	
	ii. Job Scheduling with deadlines	
Q.5(a)	Explain the Dynamic Programming approach and compare it with the Divide-and-Conquer approach.	6
Q.5(b)	Write the recurrence relation for Matrix Chain Multiplication and explain how the DP table is filled.	6

UNIT-III

Q.6(a)	Write the algorithm for Breadth- First Traversal in a graph.	6
Q.6(b)	Explain any algorithm of your choice used for finding the all-pairs shortest path in a graph.	6
Q.7(a)	What is the chromatic number of a graph? Write the chromatic number of the following graphs with proper justification, with diagrams:	6
	i. Bipartite graph	
	ii. Cyclic graph of odd length	
	iii. Complete Graph with n nodes	
	iv. a disconnected graph with two nodes and no edges	
Q.7(b)	Write the Prim's algorithm. What is it used for?	6

UNIT-IV

- Q.8** Explain the Max-Flow Min-cut problem. Find maximum flow for the network: **12**
 $S \rightarrow A(10)$, $S \rightarrow B(4)$, $A \rightarrow B(2)$, $A \rightarrow T(8)$, $B \rightarrow T(10)$. where alphabets denote network nodes and numeric values represent edge capacities.
- Q.9(a)** Explain Bitonic merge network with proper stages. **6**
Q.9(b) Write the flow through each edge of the following network graph where or each edge, the first value represents the flow value and the second stands for the capacity of the edge: **6**



Flow Network

Draw the residual network and find an augmenting path in it, if it exists.

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Roll No.....

D-1103

MCA IV Semester Examinations (Jun 2026)

Intellectual Property Rights (MCA-206A)

Time- 3hrs

Max.Marks-60

Attempt 5 questions in all by selecting one question from each unit. Question 1 is compulsory and each Question carries 12 marks.

Q.1	Marks
(a) Differentiate between Patent and Trademark.	2
(b) What is Copyright Piracy?	2
(c) Define assignment and license in Patent Law.	2
(d) What is Passing Off in Trademark Law?	2
(e) Define cybersquatting.	2
(f) Define Intellectual Property Rights (IPR)	2

UNIT-I

Q.2(a)	Explain the meaning and nature of Intellectual Property Rights. Discuss different kinds of IPRs with suitable examples	6
Q.2(b)	Explain the role of TRIPS and WTO in protection of Intellectual Property Rights.	6
Q.3	Discuss various forms of Intellectual Property Rights in detail. Compare Copyright, Patent, Trademark, Geographical Indication and Trade Secret with suitable examples.	12

UNIT-II

Q.4	Explain the procedure for registration of patents. Discuss rights and duties of patentee, surrender, revocation and remedies for patent infringement.	12
Q.5(a)	Explain different types of Copyrights and the registration procedure.	6
Q.5(b)	Discuss software copyright protection and explain copyright infringement, piracy and remedies with suitable examples.	6

UNIT-III

Q.6	Explain the concept of Trademark. Discuss types, registration procedure, infringement, offences and penalties relating to trademarks.	12
Q.7(a)	Explain the concept and objectives of Design protection.	6
Q.7(b)	Discuss Semiconductor Integrated Circuits and Layout Design Act-2000 with suitable examples.	6

UNIT-IV

Q.8	Discuss the impact of Internet and E-Commerce on Intellectual Property Rights. Explain cybercrime, digital signatures and the IT Act with suitable examples.	12
Q.9(a)	Explain Traditional Knowledge and Bio-piracy in relation to IPR.	6
Q.9(b)	Discuss Domain Name Disputes and Cybersquatting with suitable examples.	6

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