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I Semester M.C.A. Degree Examination, April/May - 2026

COMPUTER SCIENCE

Operating System Concepts and Design

(CBCS Scheme 2025)

Paper : MCA103T

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. ***Answer any Five questions from Part - A***
2. ***Answer any Four questions from Part - B***

PART - A

Answer any Five of the following questions. Each question carries 6 marks.(5×6=30)

1. What is Operating System? What are the roles of OS in Computer System?
2. Describe the primary goals of designing an Operating System.
3. Explain the concept of System Calls with the help of a suitable diagram.
4. Explain process states with a neat diagram.
5. What are Threads? Compare User-Level and Kernel - level threads.
6. Briefly explain the concept of paging.
7. Consider the given page references, calculate number of page faults occurred using FIFO Page Replacement Algorithm assuming 3 page frames.

   0, 1, 0, 2, 3, 0, 2, 4, 3, 3, 2, 0, 2, 1, 2, 7, 0, 1, 1, 0.
8. Explain different File allocation methods in detail.

PART - B

Answer any Four of the following questions. Each question carries 10 marks. (4×10=40)

9. a) Explain Linux Kernel Architecture in detail. **(5)**

   b) What is Containerization, and how does it differ from traditional Hypervisor based virtualization? **(5)**

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10. a) Define deadlock. What are its necessary conditions? Explain. (5)

b) Differentiate between deadlock prevention and avoidance. (5)

11. Considering a system with five processes P_0 through P_4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t_0 following snapshot of the system has been taken:

Process	Allocation	Max	Available
	A B C	A B C	A B C
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	4 2 2	
P_4	0 0 2	5 3 3	

a) What will be the content of the need matrix?

b) Is the system in a safe state?

c) Determine the total amount of recourses of each type? (10)

12. a) Describe the types of fragmentation. How does it impact the performance of Operating System? (6)

b) Write a short note on Thrashing. (4)

13. a) Explain different file allocation methods in detail. (5)

b) Consider a disk queue with requests for I/O to blocks on cylinders is 82, 170, 43, 140, 24, 16, 190. The head is initially at cylinder number 50. The cylinders are numbered from 0 to 199. Using SCAN Algorithm find the total head movement (In number of cylinders) incurred while servicing these requests. (5)

14. Write a short note on:

a) Semaphores in Process synchronization. (5)

b) RAID (5)

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I Semester M.C.A. Degree Examination, April/May - 2026

COMPUTER SCIENCE

Advanced Database Management Systems

(CBCS Scheme 2025)

Paper : MCA104T

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1) **Part- A: Answer any Five questions. Each question carries 6 marks.**
2) **Part- B: Answer any Four questions. Each question carries 10 marks.**

PART - A

(5×6=30)

1. Describe the three levels of abstraction in DBMS architecture.
2. Design an ER diagram for a library system identifying the entities (minimum 3), attributes, keys and the cardinality.
3. Explain multivalued dependencies and 4NF with an example.
4. Explain deadlock handling techniques.
5. Compare heuristic vs cost-based optimization.
6. Design a University data warehouse using star schema. Identify the fact & dimension tables for department-wise statistical analysis.
7. Explain MongoDB data model and CRUD operations.
8. Explain the MapReduce workflow with a neat diagram.

PART - B

(4×10=40)

9. a) Given the following Relations, formulate the following SQL queries. **(6)**

Order(Order_no, order_date, cust_id, order_status) [order status can be 'P' or 'C' for Pending and Complete respectively]

Order_dtl(Order_no, item_cd, qty_ordered)

Item(item_cd, item_description, item_rate)

i) Count the number of orders that are pending.

ii) Find customer-wise number of orders placed.

iii) List the items which have not been ordered at all.

b) Differentiate between Relational Algebra and Relational Calculus. **(4)**

[P.T.O.

10. a) Normalize the following relation up to **3NF**: **(6)**
Order (OrderID, CustomerName, CustomerAddress, ProductID, ProductName, Quantity, SupplierName, SupplierAddress)

b) Explain the ARIES recovery algorithm. **(4)**

11 a) Consider a relation: **(6)**
R(A, B, C, D, E, F)
with the following set of functional dependencies:
$A \rightarrow BC$
$B \rightarrow D$
$CD \rightarrow E$
$E \rightarrow F$
i) Compute the closure of A (A).
ii) Find all the candidate keys of the relation R.

b) What is checkpoint in recovery? **(4)**

12. a) Explain the different Transaction States with a neat diagram. **(4)**

b) Discuss OLAP operations with appropriate examples. **(6)**

13. a) Discuss database security mechanisms discretionary access control, mandatory access control, and role-based security. **(6)**

b) Explain the CAP theorem. **(4)**

14. ***Write short notes on any Two; Each one carries 5 marks:***

a) SPARK SQL
b) Cloud databases
c) XML databases

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I Semester M.C.A. Degree Examination, April/May - 2026

COMPUTER SCIENCE

Data Structures Using Java

(CBCS Scheme 2025)

Paper - MCA102T

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. ***Answer any Five questions from Section - A***
2. ***Answer any Four questions from Section - B***

SECTION - A

Answer any Five of the following questions. Each question carries 6 marks.(5×6=30)

1. Explain the different OOPs concepts with an example.
2. Explain the different types of constructors in Java with an example.
3. What are abstract classes? Explain with a programming example.
4. Explain method overloading and method overriding with an example.
5. Explain the different classifications and applications of Data Structures.
6. What is double-ended queue? Explain its implementation and applications.
7. Explain the concepts of binary search with an example.
8. Explain hash tables and collision handling techniques with an example.

SECTION - B

Answer any Four of the following questions. Each question carries 10 marks.
(4×10=40)

9. a) Explain the different features of Java in detail. **(7+3)**
   b) Write a note on JVM architecture.
10. Explain the different types of Inheritance in Java with an example.
11. Explain the mechanism of Exception handling in Java with an example.

[P.T.O.

12. Implement a Java program to perform push, pop and display operations on a stack using arrays.

13. What is linked list? Explain the insertion and deletion of singly linked list with an example.

14. Explain the different Tree traversal techniques with a programming example.

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I Semester M.C.A. Degree Examination, April/May - 2026
COMPUTER SCIENCE
Software Project Management
(CBCS 2025 Scheme)
Paper : MCA105T

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Answer any Five questions from Part - A. Answer any Four full questions from Part-B.

PART - A

Answer any Five questions. Each question carries Six marks. **(5×6=30)**

1. Define Software Project Management? Explain the importance of project management in software development.
2. Define Work Breakdown Structure (WBS)? Describe effort estimation in software projects.
3. What is project scheduling and Explain scheduling principles in software project management.
4. Differentiate between quality planning, assurance, and control.
5. Explain how monitoring and control decisions impact project outcomes.
6. Define tracking project progress and Explain its importance in Software project Management.
7. Explain hybrid project management models.
8. Explain steps involved in closing a project.

PART - B

Answer any Four full questions. Each question carries Ten marks. **(4×10=40)**

9. Explain all phases of the Software Project Life Cycle in detail. **(10)**
10. a) Compare and Discuss CPM and PERT Techniques in Network analysis. **(5)**
    b) Discuss risk identification and assessment strategies in Software project management. **(5)**

[P.T.O.

11. a) Discuss outsourcing strategies and their advantages and risks in Software projects. **(4)**

    b) Explain Software Configuration Management Process. **(6)**

12. Explain Communication planning, stakeholder management, leadership styles in Software projects. **(10)**

13. a) Discuss Git and SVN Software Configuration Management Tools with Features. **(5)**

    b) Write short note on Function Point Analysis (FPA) Project Estimation Technique. **(5)**

14. a) Explain CMMI framework levels. **(5)**

    b) Briefly discuss JIRA, Trello Project Management Tools with features. **(5)**

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I Semester M.C.A. Degree Examination, April/May - 2026 126009

COMPUTER SCIENCE

Computational Mathematics and Statistics

(CBCS Scheme 2025)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

1. ***Answer any Five questions from Part - A.***
2. ***Answer any Four questions from Part - B.***

PART - A

Answer any Five of the following questions. Each question carries 6 marks.(5×6=30)

1. a) Explain Logical equivalence between two propositions with example.

b) Construct the truth table for : $(p \to q) \wedge (p \vee q)$. **(3+3)**

2. a) Explain predicates and quantifiers with examples.

b) If $A = \{3,4\}, B = \{2,4\}, C = \{4,5\}$.

Then Verify : A × (B - C) = (A × B) - (A × C) **(3+3)**

3. a) State the Pigeonhole Principle and give one application.

b) In how many ways can the letters of the word 'PERMUTATIONS' be arranged such that all the vowels are together? **(3+3)**

4. a) Evaluate : $^{7}P_{3}$ and $^{7}C_{3}$.

b) A committee of 7 has to be formed from 8 boys and 4 girls. In how many ways can this be done when the committee consist of atleast 3 girls? **(3+3)**

5. a) A die is thrown once. Find the probability of getting number divisible by 2 or divisible by 3.

b) Define Conditional Probability. If P(A) = 0.5, P(B) = 0.4 and $P(A \cap B) = 0.2$, *find* $P(A/B)$. **(3+3)**

[P.T.O.

6. A random variable X has the following probability function.

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

a) Determine k

b) Find Mean of X **(6)**

7. A population consists of the Five numbers 2, 3, 6, 8,11. Consider all possible samples of size two which can be drawn with replacement from this population

Find:

a) The mean of the population

b) The standard deviation of the population.

c) The mean of the sampling distribution of means. **(6)**

8. a) Find the arithmetic mean of the numbers

5, 3, 6, 5, 4, 5, 2, 8, 6, 5, 4, 8, 3, 4,5, 4, 8, 2, 5,4

b) Explain Maximum Likelihood Estimation (MLE) **(3+3)**

PART - B

Answer any Four of the following questions. Each question carries 10 marks.

(4×10=40)

9. a) Check the validity of the argument:

$p \rightarrow qv \sim r$

$q \rightarrow p \wedge r$

$\therefore p \rightarrow r$

b) Prove that: $(A \cap B)' = A' \cup B'$ using the element method. **(5+5)**

10. a) If f: $R \rightarrow R$, is defined by f(x) = 5x-7, Show that f is one-one and onto function.

b) In a group of 80 students, 42 learn Java and 60 learn Python. Each student learns atleast one of the two programming languages. Find how many students learn both Java and Python? **(5+5)**

11. a) State and prove the Binomial theorem.

b) Find the middle term in the expansion $\left(\frac{x}{3}+9y\right)^{10}$ **(5+5)**

12. a) Explain the various approaches to probability with suitable examples.

b) A card is drawn from a pack of well shuffled cards. Find the probability of drawing

i) A red card

ii) A spade

iii) A king

iv) A queen or a jack. (5+5)

13. a) Distinguish between Independent and dependent events with examples.

b) Three machines A, B and C manufacture 30%, 50% and 20% of the total production respectively. The percentage of defective items produced by A, B and C are 3, 6 and 2 respectively. If an item is chosen at random and is found to be defective, find the probability of it being a product of C. (5+5)

14. a) Explain the different types of sampling methods with suitable examples.

b) A random sample of 50 mathematics grades, selected from a total of 200 grades, has a mean of 75 and a standard deviation of 10. Find the 95% confidence limits for the mean of all 200 grades. (5+5)

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I Semester M.C.A. Degree Examination, April/May - 2026

COMPUTER SCIENCE

Software Testing With Selenium

(CBCS Scheme 2025)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Answer All Sections.

SECTION - A

Answer any Five of the following questions. Each question carries 6 marks.(5×6=30)

1. Explain Software Development Life Cycle and Testing with examples.
2. Explain Test Levels and Types.
3. Explain Test Automation Concepts.
4. Define Selenium and explain its components.
5. Explain Selenium Web Driver Architecture.
6. Explain the Page Object Model (POM).
7. Explain distributed testing with Selenium Grid.
8. Discuss Emerging Trends in Test Automation.

SECTION - B

Answer any Four of the following questions. Each question carries 10 marks.
(4×10=40)

9. a) Explain Software Testing Life Cycle. **(5)**
   b) Explain static vs. dynamic testing with example. **(5)**
10. Explain Selenium Overview and installation setup. **(10)**
11. a) Explain TestNG Framework. **(5)**
    b) Discuss Automating User Actions. **(5)**

[P.T.O.

12. a) Explain in detail Data-driven testing using Apache POI. **(5)**

b) Explain Integrating Selenium with Jenkins, Maven, and Git. **(5)**

13. a) Explain Selenium with BDD in detail. **(5)**

b) Discuss cloud-based testing platforms. **(5)**

14. Discuss about the Case study automating a sample web application using Selenium end-to-end. **(10)**
