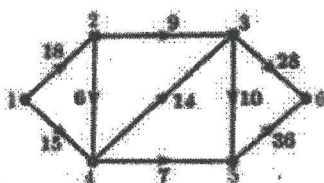


St Aloysius (Deemed to be University)**Mangaluru****School of Information Science and Technology (PG Programme)****Semester I-PG Examination- MCA****November-2025****Mathematical Foundation for Computer Applications****Time: 2¹/₂ Hours****Max Marks: 60****Note: i) Answer all the questions****ii) Draw diagrams wherever necessary****SECTION - A****Answer any FIVE of the following.****(5x2=10)**

1. a. Define union and intersection of two sets.
- b. Define a set with an example.
- c. Write the equivalence of $\neg(p \vee q)$ using De Morgan's Laws.
- d. Define a conditional statement and write its symbolic form.
- e. Define a graph with an example.
- f. Mention one advantage of the Gauss-Seidel method over the Gauss-Jacobi method.
- g. Define a random variable.

SECTION - B**Answer any SIX of the following.****(6x5=30)**

2. The probability that a pen manufactured by a factory be defective is $1/10$. If 12 such pens are manufactured, what is the probability that (i) exactly 2 are defective (ii) at least 2 are defective (iii) none of them are defective.
3. (a) Given $A = \{1, 2, 3, 4\}$ and $B = \{2, 4\}$:
 - (i) Verify if $B \subseteq A$.
 - (ii) Write all proper subsets of B.
 - (iii) How many subsets does A have?
- (b) Let $X = \{p, q\}$:
 - (i) Write the power set of X.
 - (ii) Verify the number of elements in the power set.
4. Using the Dijkstra's algorithm, find the shortest path and its weight from the vertex 1 to each of other vertices in the following directed network

**Contd...2**

5. Examine whether the compound proposition $(p \vee (q \wedge r)) \vee \sim (p \vee (q \wedge r))$ is a tautology.
6. Prove that $(p \vee q) \wedge (p \wedge (p \wedge q)) \Leftrightarrow (p \wedge q)$, by using rules of Logic
7. Solve the following system of equations using the Gauss Jordan method.

$$\begin{aligned} 2x + y + 3z &= 1 \\ 4x - 3y + 5z &= -7 \\ -3x + 2y + 4z &= -3 \end{aligned}$$
8. Solve the following system of equations using the Gauss elimination method with partial pivoting.

$$\begin{aligned} 10x_1 - x_2 + 2x_3 &= 4 \\ x_1 + 10x_2 - x_3 &= 3 \\ 2x_1 + 3x_2 + 20x_3 &= 7 \end{aligned}$$
9. A number is selected at random from the numbers 1 to 30. What is the probability that
 - i. It is divisible by either 3 or 7
 - ii. It is divisible by 5 or 13

SECTION-C

Answer any **TWO** of the following.

(2x10=20)

10. Explain Gauss- Seidel iterative method and hence solve the following system of equations using Gauss- Seidel method. (Carry out 6 iterations)

$$\begin{aligned} x + 20y + 9z &= -23 \\ 2x - 7y - 20z &= -57 \\ 20x + 2y + 6z &= 28 \end{aligned}$$
11. An unbiased coin is tossed six times. What is the probability that the tosses will result in
 - i. exactly 3 heads
 - ii. at least 4 heads
 - iii. at most 2 heads
 - iv. no heads
 - v. Getting more heads than tails.
12. A random variable x has the following density function

$$P(x) = \begin{cases} kx^2, & -3 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

Evaluate k and find (i) $P(1 \leq x \leq 2)$ (ii) $P(x \leq 2)$ (iii) $P(x > 1)$
 (iv) mean (v) variance

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St Aloysius (Deemed to be University)

Mangaluru

School of Information Science and Technology (PG Programme)

Semester I-PG Examination- MCA

November-2025

Advanced Data Structures and Algorithms

Time: 2¹/₂ Hours

Max Marks: 60

Note: i) Answer all the questions

ii) Draw diagrams wherever necessary

SECTION - A

Answer any FIVE of the following.

(5x2=10)

1. a. Define primitive data structures with example.
- b. Define Big-O notation.
- c. State the principle of stack operation.
- d. Define postfix expression.
- e. Write the general structure of a polynomial term in linked list representation.
- f. Give one application of doubly linked lists.
- g. Draw the expression tree for: $(a+b)*(c-d)(a+b) * (c-d)(a+b)*(c-d)$

SECTION - B

Answer any SIX of the following.

(6x5=30)

2. Draw and explain the array representation of a queue.
3. Explain insertion sort with an example.
4. Write a program to check whether a number is even or odd using if-else.
5. Show stepwise insertion and deletion in a circular queue of size 5.
6. Explain array representation of binary trees with advantages and disadvantages.
7. Write code in C++ to traverse a singly linked list and print its elements.
8. Explain deletion of the last node in a circular linked list.
9. Discuss advantages and disadvantages of binary trees.

SECTION-C

Answer any TWO of the following.

(2x10=20)

10. Discuss various applications of trees in data structures and algorithms.
11. Implement merge sort and explain with an example.
12. Explain in detail how to analyze an algorithm with an example.

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St Aloysius (Deemed to be University), Mangaluru

School of Information Science and Technology (PG Programme)

Semester I-PG Examination- MCA

November-2025

Advanced Database Management Systems

Time: 2¹/₂ Hours

Max Marks: 60

Note: i) Answer all the questions

ii) Draw diagrams wherever necessary

SECTION - A

Answer any FIVE of the following.

(5x2=10)

1. a. What is the degree of relationship? Give example.
- b. Mention any two drawback of the file management system.
- c. What is a cursor in PL/SQL?
- d. What is normalization in databases?
- e. List the components of DDBMS.
- f. What is the use of the LIKE operator? Give one example
- g. Differentiate between read lock and exclusive lock.

SECTION - B

Answer any SIX of the following.

(6x5=30)

2. Explain Implicit and Explicit cursor attributes.
3. Differentiate between DDL, DML, DCL.
4. Discuss structured, unstructured, and semi-structured data types, providing examples to illustrate each category's characteristics.
5. Explain any 3 relational algebra operations with example
6. Explain aggregate functions and set operators in SQL.
7. Define a transaction, provide a detailed explanation of the ACID properties, and illustrate each property with examples
8. Define a subquery and elaborate on its characteristics and types. Provide an example to illustrate its usage and discuss its distinctive features.
9. What is a Business Rule? How can you apply it in Oracle? Give two examples.

SECTION-C

Answer any TWO of the following.

(2x10=20)

10. Discuss the concept of concurrent transitions and any three problems associated with it. Also discuss about 2PL.
11. Discuss the process of query processing and optimization. Explain heuristic and cost-based optimization approaches
12. Explain the concepts of keys in DBMS. Illustrate with examples the difference between Super Key, Candidate Key, Primary Key, Unique Key, and Foreign Key

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St Aloysius (Deemed to be University)

Mangaluru

School of Information Science and Technology (PG Programme)

Semester I-PG Examination- MCA

November-2025

Enterprise Computing with Advanced Java

Time: 2¹/₂ Hours

Max Marks: 60

Note: i) Answer all the questions

ii) Draw diagrams wherever necessary

SECTION - A

Answer any FIVE of the following.

(5x2=10)

1. a. Write the syntax for defining an interface in Java.
- b. Define dynamic method dispatch with an example scenario.
- c. What is the significance of Enterprise JavaBeans (EJB) in Java EE?
- d. What is the role of containers in Java EE?
- e. How do you retrieve session information in JSP?
- f. What is JSP Unified Expression Language (EL)?
- g. What is the role of JDBC Driver Manager.

SECTION - B

Answer any SIX of the following.

(6x5=30)

2. With suitable examples, differentiate between Session beans and Entity beans.
3. Explain how records can be updated and deleted using a ResultSet object.
4. Explain the concept of inheritance in Java. How does it promote reusability?
5. Explain the different session tracking mechanisms in servlets. Compare cookies and URL rewriting.
6. Explain how initialization parameters are passed to filters.
7. Compare JSP Model-I and Model-II architectures with examples.
8. Explain JSP action tags with suitable examples.
9. Discuss the challenges of using JDBC directly in large-scale applications

SECTION-C

Answer any TWO of the following.

(2x10=20)

10. Write a JDBC program to implement all CRUD operations (Insert, Update, Delete, Select) on a "Student" table.
11. Explain the architecture of Enterprise JavaBeans (EJB). With a neat diagram, describe how EJB components interact with the container and server.
12. Explain in detail the various levels of access allowed on members of class and subclass within the package and outside the package.

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St Aloysius (Deemed to be University), Mangaluru
School of Information Science and Technology (PG Programme)
Semester I-PG Examination- MCA
November-2025

Web Application Development using Python

Time: 2¹/₂ Hours

Max Marks: 60

- Note:** i) Answer all the questions
ii) Draw diagrams wherever necessary

SECTION - A

Answer any FIVE of the following. (5x2=10)

1. a. Define a function add_numbers(a, b) that returns the sum of two numbers. Call it with 5 and 7.
- b. Explain string slicing with an example to print the word 'thon' from the string 'Python'.
- c. How can you update a record in the database using Python and SQL?
- d. What does the file pointer do, and how can you move it using Python?
- e. What is the purpose of the __init__() method in a Python class?
- f. Explain span() and group().
- g. What is the use of Django sessions?

SECTION - B

Answer any SIX of the following. (6x5=30)

2. Explain with example different types of exceptions.
3. Explain the use of break, continue, and pass in Python loops with examples
4. Summarize various operators, built-in functions and standard library modules that deals with Python's numeric type
5. Create two sets with some common elements. Write a program to: i) Find the union ii) Find the intersection iii) Find the difference
6. Write a program to i) Create a list of 5 numbers ii) Append a new number iii) Remove the second number iv) Sort the list in descending order v) Accessing elements using positive and negative indices.
7. Explain single and multiple inheritance in Python. Write a small program demonstrating multiple inheritance.
8. What is Django? Discuss its advantages and why it is a preferred choice for web development.
9. Describe the use of try, except, else, and finally blocks in Python. Give an example of a file operation safeguarded by exception handling.

SECTION-C

Answer any TWO of the following. (2x10=20)

10. Describe the step-by-step procedure to connect to an SQLite database in Python using the sqlite3 module. Include how to create a connection and cursor. Write a code example.
11. Write a Python program that i) Accepts a sentence from the user ii) Removes all punctuation iii) Replaces all spaces with hyphens iv) Converts the final result to title case. Explain each step with the corresponding string method used.
12. Describe the typical Django project structure. Explain the purpose of each key folder and file such as manage.py, settings.py, urls.py, and wsgi.py.
