C–7569	Sub. Code 80515

B.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

IT & Logistics

MATHEMATICS - I

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. What is the value of $\sin 45^\circ$?

   (a) 1 (b) $\sqrt{3}/2$

   (c) $1/\sqrt{2}$ (d) $\sqrt{2}/2$

2. Which of the following is not true?

   (a) $\sin^2\theta + \cos^2\theta = 1$

   (b) $\tan\theta = \sin\theta / \cos\theta$

   (c) $\sin x \approx x$ for small x

   (d) $\cos x \approx x$ for small x

3. The function $f : R \to R$ defined by $f(x) = x^2$ is;

   (a) One-one and onto

   (b) One-one but not onto

   (c) Not one-one but onto

   (d) Neither one-one nor onto

4. If every element of set A is related to exactly one element of set, the relation is:

(a) Partial relation

(b) Function

(c) Equivalence relation

(d) Reflexive relation

5. A Hermitian matrix A satisfies,

(a) $A^H = A$ (b) $A^T = A$

(c) $A^* = -A$ (d) $A^H = -A$

6. If A is a real symmetric matrix, then

(a) It is automatically unitary

(b) It is automatically Hermitian

(c) It is automatically Skew-Hermitian

(d) None

7. A polynomial equation of degree n has

(a) Exactly n real roots

(b) At most n complex roots

(c) Exactly n roots, counting multiplicity

(d) None

8. If $p(x)$ has real coefficients and $2 + 3i$ is a root, then

(a) $2 - 3i$ is also a root

(b) $-2 + 3i$ is also a root

(c) Only real roots

(d) The degree must be even

9. If $y = \sin ax$, then $\frac{d^n y}{dx^n}$ is,

(a) $a^n \sin(ax + n\pi/2)$ (b) $a^n \cos(ax + n\pi/2)$

(c) $a^n \sin(ax - n\pi/2)$ (d) $a^n \cos(ax - n\pi/2)$

10. For $f(x, y)$ a stationary point occurs when,

(a) $\frac{\partial f}{\partial x} = 0$ and $\frac{\partial f}{\partial y} = 0$ (b) $\frac{\partial^2 f}{\partial x^2} = 0$

(c) $\frac{\partial^2 f}{\partial y^2} = 0$ (d) $\frac{\partial^2 f}{\partial x \partial y} = 0$

Part B

$(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b)

11. (a) In a ΔABC, right angle at A, If $AB = 12$, $AC = 5$ and $BC = 13$. Find the value of $\sin B, \cos B$ and $\tan B$.

Or

(b) Evaluate

(i) $\cos(-750^\circ)$

(ii) $\sin(-240^\circ)$

12. (a) Let $A = \{1, 2, 3\}$ and $B = \{2, 3, 4, 5\}$. Find the following (i) $A \cup B$, (ii) $A \cap B$ (iii) $A - B$

Or

(b) If $n(U) = 50$, $n(A) = 28$, $n(B) = 32$ and $n(A \cap B) = 15$. Find (i) $n(A \cup B)$ (ii) $n(A' \cap B')$.

13. (a) Find the inverse of $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$ using the adjoint method.

Or

(b) Solve the system of equation using Cramer's rule $x + 2y = 5$, $3x - y = 4$.

14. (a) Find a polynomial equation of the lowest degree with rational coefficients having $\sqrt{3}$ and $1 - 2i$ as two of its roots.

Or

(b) Solve the equation $15x^3 - 23x^2 + 9x - 1 = 0$ whose roots are in harmonic progression.

15. (a) Find y_n, where $y = \frac{3}{(x+1)(2x-1)}$.

Or

(b) Find the maximum value of $\frac{\log x}{x}$ for positive values of x.

Part C (5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b)

16. (a) Prove that $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$.

Or

(b) Expand $\sin 7\theta$ in powers of $\cos\theta$ and $\sin\theta$. Hence prove that $\frac{\sin 7\theta}{\sin\theta} = 7 - 56\sin^2\theta + 112\sin^4\theta - 64\sin^6\theta$.

17. (a) Let $f : R \to R$ be defined by $f(x) = 5x - 7$.

(i) Show that f is one to-one and onto.

(ii) Find $f^{-1}(x)$

(iii) Verify that $f^{-1}(f(x)) = x$ and $f(f^{-1}(x)) = x$

Or

(b) Let $A = \{1, 2, 3, 4\}$ and $R = \{(a,b) : a \text{ divides } b\}$

(i) Show that R is a partial order relation

(ii) Draw its Hasse diagram.

18. (a) Verify the Cayley-Hamilton theorem for

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}.$$

Or

(b) Solve the equation $2x + y - z = 3$, $x + y + x = 1$, $x - 2y - 3x = 4$, using Cramer's rule.

19. (a) Solve the equation

$$60x^4 - 736x^3 + 1433x^2 - 736x + 60 = 0$$

Or

(b) Discuss the nature of roots of the equation $x^9 + 5x^8 - x^3 + 7x + 2 = 0$.

20. (a) Find the dimensions of a cylindrical vessel of greatest capacity which can be made from a given amount of sheet of metal, when the vessel has no lid and the vessel has a lid.

Or

(b) Show that the least value of $a^2 \sec^2 x + b^2 \operatorname{cosec}^2 x$ is $(a+b)^2$.

C–7570	Sub. Code 80516

B.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

IT & Logistics

PROBLEM SOLVING TECHNIQUES

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The first step in Problem Solving is _____

   (a) Understand the Problem

   (b) Developing Algorithm /Flowchart

   (c) Identify the Problem

   (d) Listing the Possible outcome

2. The Operator && is an example for _____ operator

   (a) Assignment (b) Increment

   (c) Logical (d) Rational

3. What is the size of an empty Structure in C?

   (a) 0bytes

   (b) 1bytes

   (c) It varies depending on the complier

   (d) 4bytes

4. What does the size of operator in C return for a Union?

(a) Total size of all union members

(b) Size of the largest member

(c) Size of the smallest member

(d) Size of the Union itself

5. What is the value of a pointer variable if it hasn't been assigned any address?

(a) 0 (b) Null

(c) Undefined (d) 1

6. Prior to using a pointer variable it should be

(a) Declare

(b) Initialized

(c) Both declare and initialized

(d) none of these

7. Which of the following is the correct recursive formula for calculating the factorial of a number n?

(a) Fact(n)n*fact(n)

(b) Fact(n)=n*fact(n+ 1)

(c) Fact (n)n*fact(n-l)

(d) Fact(n)n*fact(1)

8. How many passes does an insertion sort algorithm consist of

(a) N (b) N-1

(c) N+1 (d) N^2

9. How many factors does a prime number have?

(a) 1 (b) 2

(c) 3 (d) It varies

10. Which of the following is not a Fibonacci number?

(a) 8 (b) 21

(c) 55 (d) 14

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain about the Requirements for solving problem by computer.

Or

(b) Discuss about the Prototypes and Operators.

12. (a) Detail about the fundamentals of union and array structure elements.

Or

(b) Explain about the anonymous structure and unions.

13. (a) Explain about the Pointers and array.

Or

(b) Discuss about the ASCII and binary files.

14. (a) Details about the Factorial Computation with an Example.

Or

(b) Explain about the insertion search algorithm.

15. (a) Discuss about the array order reversal.

Or

(b) Detail about the Fibonacci number with an example.

Part C (5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) Explain about the Multi dimensional arrays with an Example.

Or

(b) Details about the Control Structure.

17. (a) Details about the control directive and # pragma directive.

Or

(b) Explain about the Token pasting operator with an example.

18. (a) Discuss about the Operation on String.

Or

(b) Detail explanation about the file pointer

19. (a) Explain about the insertion search algorithm with an Example.

Or

(b) Discuss about the linear search algorithm with an Example.

20. (a) Explain about the GCD of two integers.

Or

(b) Detail about the prime number generate with an Example.

C–7571

Sub. Code
80535

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

IT and Logistics

DATA STRUCTURES AND ALGORITHMS

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. What is the primary purpose of data structures?

   (a) To store and organize data efficiently

   (b) To improve the speed of internet connections

   (c) To create graphical user interfaces

   (d) To design operating systems

2. Which asymptotic notation represents the upper bound of an algorithm's running time?

   (a) Ω (Omega)

   (b) θ (Theta)

   (c) O (Big-Oh)

   (d) Σ (Sigma)

3. Which of the following data structures allows insertion and deletion only from one end?

(a) Queue

(b) Doubly Linked List

(c) Circular Queue

(d) Stack

4. In a doubly inked list, what is the primary advantage over a singly linked list?

(a) It requires less memory

(b) It has a faster insertion time

(c) It allows traversal in both forward and backward directions

(d) It does not require a head pointer

5. In a pre-order traversal of a binary tree, which node is visited first?

(a) The left child of the root

(b) The root node itself

(c) The right child of the root

(d) The last leaf node

6. Which graph traversal algorithm uses a queue data structure?

(a) Breadth-First Search (BFS)

(b) Depth-First Search (DFS)

(c) Dijkstra's Algorithm

(d) Prim's Algorithm

7. The Knapsack problem is a classic example of which algorithmic design paradigm?

(a) Divide and Conquer

(b) Dynamic Programming

(c) Greedy method

(d) Backtracking

8. Which algorithmic design method is used to solve the Multistage Graph problem?

(a) Divide and Conquer

(b) Greedy Method

(c) Brute Force

(d) Dynamic Programming

9. Binary search can be efficiently applied to which of the following data structures?

(a) A linked list

(b) A sorted array

(c) A hash table

(d) A binary tree that is not necessarily sorted

10. Which searching algorithm requires the input array to be sorted beforehand?

(a) Binary Search

(b) Linear Search

(c) Hashing

(d) Bubble Sort

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the step-count method for performance analysis of algorithms.

Or

(b) Define Big-Oh notation and explain its significance in algorithm analysis.

12. (a) Elaborate the insertion and deletion operations in a singly linked list.

Or

(b) Explain the representation of a stack using an array.

13. (a) Describe the binary tree's recursive traversal techniques.

Or

(b) What are the adjacency matrix and adjacency list representations of a graph?

14. (a) Describe the Knapsack problem by applying the greedy approach.

Or

(b) How can the Multistage Graph problem be solved using Dynamic Programming?

15. (a) Give short notes on the Quick Sort algorithm.

Or

(b) Explain the Binary Search algorithm.

Part C

(5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) What are the main components and properties of an algorithm? Discuss in detail.

Or

(b) Define Big-Oh notation and explain how it describes the time complexity of an algorithm with examples.

17. (a) How are arrays represented in memory, and what operations can be performed on them?

Or

(b) Explain the structure of a doubly linked list

18. (a) Discuss the representation of graphs and the traversal algorithms (DFS and BFS).

Or

(b) Discuss the time and space complexity of DFS and BFS. When is one preferred over the other?

19. (a) How does the Divide and Conquer strategy work? Explain using an example.

Or

(b) What are state and decision variables in Dynamic Programming? Explain with an example related to multistage graph problems.

20. (a) Discuss the Merge Sort algorithm with an example.

Or

(b) Explain the concept of a hash function. How should a good hash function be designed? Provide examples of common hash functions.

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C–7572

Sub. Code
80536

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

IT & Logistics

PROGRAMMING IN JAVA

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The smallest unit of information in Java is called a _____.
   (a) Byte (b) Bit
   (c) Variable (d) Token

2. In Java, the 'new' keyword is used to _____.
   (a) Declare variables (b) Create objects
   (c) Start programs (d) Define methods

3. A _____ initializes a new object when it is created.
   (a) Method (b) Constructor
   (c) Class (d) Variable

4. Overriding methods must have the same _____ as the method in the superclass.
   (a) Name and parameters
   (b) Name only
   (c) Return type only
   (d) Access modifier only

5. The keyword 'throw' is used to _____ an exception explicitly.

(a) Catch (b) Declare

(c) Generate (d) Ignore

6. Deadlock in multithreading occurs when two or more threads are

(a) Running simultaneously

(b) Waiting indefinitely for each other's resources

(c) Sleeping

(d) Terminated

7. An applet is a small Java program that runs inside a _____.

(a) Browser (b) Server

(c) Console (d) Desktop

8. The Scanner class is part of the _____ package.

(a) java.util (b) java.io

(c) java.lang (d) java.net

9. The main class used to create a window in AWT is _____.

(a) Frame (b) Window

(c) Dialog (d) Panel

10. In BorderLayout, the center region is accessed using the constant _____.

(a) BorderLayout.CENTER

(b) BorderLayout.MIDDLE

(c) BorderLayout.CORE

(d) BorderLayout.CENTER REGION

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Define Java and list its main features.

Or

(b) Explain the use of the 'if' and 'else' control statements with examples.

12. (a) Explain the role of constructors in Java.

Or

(b) What is inheritance? Explain its advantages.

13. (a) Define a package in Java and explain its importance.

Or

(b) Describe the purpose of synchronization in Java multithreading.

14. (a) Describe the life cycle of a Java applet.

Or

(b) Describe the use of the Random class with an example.

15. (a) Name and briefly describe three commonly used AWT controls.

Or

(b) Explain the significance of the CheckboxMenuItem in AWT menus.

Part C (5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) Elaborate on various control flow statements in Java and their role in program logic.

Or

(b) Discuss how arrays are managed in Java and the importance of arrays in programming.

17. (a) Describe the types of inner classes in Java and their use cases.

Or

(b) Elaborate on the String class in Java, focusing on its key methods and immutability.

18. (a) Explain the different access modifiers available in Java and their significance in access protection.

Or

(b) Illustrate with examples how multithreading improves the performance of Java programs.

19. (a) Explain file handling in Java using FileInputStream and FileOutputstream with sample code.

Or

(b) Explain the importance of character arrays and demonstrate their use in Java.

20. (a) Explain how layout managers affect the design of GUI applications and why they are important.

Or

(b) Describe the process to create and manage nested menus in AWT applications.

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C–7573

Sub. Code
80538

B.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

IT & Logistics

STATISTICAL & NUMERICAL METHODS

(2023 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. What type of data is measured on a nominal scale?
   (a) Temperature (b) Time
   (c) Height (d) Gender

2. What is the geometric mean of 2, 4, and 8?
   (a) 4 (b) 5
   (c) 3 (d) 6

3. Which chart is best suited to represent proportions or percentages?
   (a) Histogram (b) Line Chart
   (c) Pie Chart (d) Scatter Plot

4. Which of the following is not a characteristic of a good measure of dispersion?
   (a) Based on all values
   (b) Rigidly defined
   (c) Easy to compute
   (d) Affected by extreme values

5. The best fit line in regression is calculated using:

(a) Monte Carlo

(b) Matrix Inversion

(c) Least Squares Method

(d) Numerical Differentiation

6. The coefficient of determination (R^2) lies between:

(a) –1 to 0 (b) 0 to 1

(c) –1 to 1 (d) 1 to 10

7. Which is a non-probability sampling method?

(a) Cluster Sampling

(b) Judgment Sampling

(c) Stratified Sampling

(d) Systematic Sampling

8. The midpoint of interval is used in:

(a) Newton-Raphson (b) Secant

(c) Bisection Method (d) Simpson's Rule

9. Which method gives better results for parabolic functions?

(a) Trapezoidal

(b) Simpsons 1/3 Rule

(c) Euler

(d) Gauss-Jordan

10. A method for solving differential equations numerically is:

(a) Monte Carlo (b) Euler's Method

(c) Regression (d) Interpolation

Part B

(5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Compare mean and geometric mean with examples.

Or

(b) Write short notes on types of data scales.

12. (a) Explain box plot and its advantages in data visualization.

Or

(b) Discuss quartile deviation and its use in variability.

13. (a) Define coefficient of determination and interpret its values.

Or

(b) Differentiate regression of Y on X and X on Y.

14. (a) Explain judgment sampling and quota sampling.

Or

(b) Explain the procedure of stratified random sampling.

15. (a) Solve a first-order ODE using Euler's method.

Or

(b) Define order and degree of differential equations with examples.

Part C

(5 × 8 = 40)

Answer **all** questions, choosing either (a) or (b).

16. (a) Discuss central tendency for grouped vs ungrouped data.

Or

(b) Compute geometric and harmonic mean for given data.

17. (a) Explain detection and treatment of outliers in datasets.

Or

(b) Compare variance and standard deviation with calculation.

18. (a) Derive regression equations using least squares method.

Or

(b) Solve a linear regression problem with two variables.

19. (a) Describe Midpoint and Trapezoidal Rules with diagrams.

Or

(b) Compare Simpson's 1/3 and 3/8 rule with an example.

20. (a) Solve a first-order ODE using Modified Euler method.

Or

(b) Solve an ODE using Runge-Kutta 2nd Order Method.
