

Sl. No.

B2.1-R4 : DATA STRUCTURE THROUGH C++

DURATION : 03 Hours

MAXIMUM MARKS : 100

OMR Sheet No. :

Roll No. :

Answer Sheet No. :

Name of Candidate : _____ ; **Signature of Candidate :** _____

INSTRUCTIONS FOR CANDIDATES :

- Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.
- Question Paper is in English language. Candidate has to answer in English language only.
- There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
- **PART ONE** is Objective type and carries **40** Marks. **PART TWO** is Subjective type and carries **60** Marks.
- **PART ONE** is to be answered in the **OMR ANSWER SHEET** only, supplied with the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.
- Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the Answer Sheet for **PART ONE** is returned. However, Candidates who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the Answer Sheet for **PART ONE** to the Invigilator.
- **Candidate cannot leave the examination hall/room without signing on the attendance sheet and handing over his/her Answer Sheet to the invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
- After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question Booklet is complete in all respect.

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

PART ONE

(Answer ALL the questions ; each question carries ONE mark)

- 1. Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "OMR" answer sheet supplied with the question paper, following instructions therein.**

(1x10)

- 1.1** Representation of data structure in memory is known as _____.

- (A) Storage Structure
- (B) File Structure
- (C) Recursive
- (D) Abstract Data Type

- 1.2** Which of the following sorting algorithms provide the best time complexity in the worst-case scenario ?

- (A) Merge Sort
- (B) Quick Sort
- (C) Bubble Sort
- (D) Selection Sort

- 1.3** Which of the following data structure is used to perform recursion ?

- (A) Linked list
- (B) Array
- (C) Queue
- (D) Stack

- 1.4** The number of distinct simple graphs with up to three nodes is _____.

- (A) 15
- (B) 10
- (C) 9
- (D) 7

- 1.5** A full binary tree with n leaves contains :

- (A) n nodes
- (B) $\log_2 n$ nodes
- (C) $2n - 1$ nodes
- (D) $2n$ nodes

- 1.6** Which of the following is a Divide and Conquer algorithm ?

- (A) Bubble Sort
- (B) Selection Sort
- (C) Heap Sort
- (D) Merge Sort

- 1.7** What is the best case time complexity of the binary search algorithm ?

- (A) $O(1)$
- (B) $O(n)$
- (C) $O(\log_2 n)$
- (D) $O(n^2)$

- 1.8 A data structure in which elements can be inserted or deleted at/from both ends but not in the middle is _____.
- (A) Queue
- (B) Circular queue
- (C) Priority queue
- (D) Dequeue
- 1.9 Which of the following is not the member of class ?
- (A) Static function
- (B) Friend function
- (C) Constant function
- (D) Virtual function
- 1.10 What is Inheritance in C++ ?
- (A) Deriving new classes from existing classes
- (B) Overloading of classes
- (C) Classes with same names
- (D) Wrapping of data into a single class
2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein.
- (1x10)
- 2.1 A queue cannot be implemented using in an array.
- 2.2 Every node in a linked list has two components : one to store the relevant information and one to store the address.
- 2.3 Binary search is always faster than linear search.
- 2.4 An $O(\log N)$ algorithm is faster than an $O(N)$ algorithm.
- 2.5 Most appropriate data structure to print a list of elements in reverse order is Queue data structure.
- 2.6 To delete a dynamically allocated tree, the best traversal method is post-order traversal.
- 2.7 In a binary tree, every node has exactly two children.
- 2.8 Average case running time of Bubble sort is $O(n \log n)$.
- 2.9 Graph is a non-linear data structure.
- 2.10 Prefix and Postfix expressions can be evaluated faster than an infix expression.

3. Match words and phrases in column X with the closest related meaning / word(s) / phrase(s) in column Y. Enter your selection in the "OMR" answer sheet supplied with the question paper, following instructions therein.

(1x10)

	X		Y
3.1	An operator in C++ for new line	A.	Linear
3.2	Average case time complexity of merge sort is	B.	Divide and Conquer Algorithm
3.3	Worst case complexity of bubble sort is	C.	Stacks
3.4	Quick sort is a	D.	$O(n \log n)$
3.5	Data structure allows deleting data elements from front and inserting at rear	E.	$O(n^2)$
3.6	An algorithm that calls itself directly or indirectly is called	F.	Radix Sort
3.7	The sorting method used for external sort is	G.	Conditional Operator
3.8	If-else statement can be replaced with	H.	Recursion
3.9	Storage classes that have global visibility	I.	endl
3.10	$O(n)$ means computing time is	J.	Quick Sort
		K.	Queues
		L.	Register
		M.	Cubic

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Choose the most appropriate option, enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein.

(1x10)

A.	Private	B.	Stack	C.	TOP	D.	Two
E.	External Sorting	F.	Push	G.	Three	H.	Algorithm
I.	Inner	J.	Zero	K.	BFS	L.	Leaf
M.	Internal Sorting						

4.1 Merge sort is _____.

4.2 _____ is the step by step procedure for calculation.

4.3 Queue data structure is used in _____.

4.4 _____ is used to declared secure data members in a class in C++.

4.5 The first element in a stack is called the _____ of the stack.

4.6 The operation on stack that increments the top is called _____.

4.7 Number of pointers required in a node of doubly linked list _____.

4.8 An isolated node in a graph has out-degree as _____.

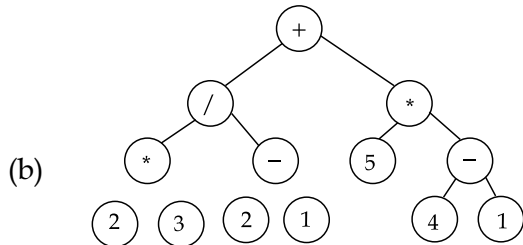
4.9 A tree node that has no children is called a _____ node.

4.10 The optimal data structure used to solve Tower of Hanoi is _____.

PART TWO

(Answer ANY FOUR questions)

5. (a) Explain the concept of operator overloading with suitable example.



Write the infix, prefix and postfix form of given expression tree.

(7+8)

6. (a) Explain the terms :

- (i) Inheritance
- (ii) Polymorphism
- (iii) Encapsulation

- (b) Convert the expression $((A + B) * C - (D - E) ^ (F + G))$ to equivalent postfix notations.

- (c) Differentiate between linear and nonlinear data structure.

(6+5+4)

7. (a) Write an algorithm to insert and delete the elements of a queue.

- (b) Construct the binary search tree for the given data 50, 70, 60, 20, 90, 10, 40, 100. Also perform in-order, preorder and post-order traversal of the same tree.

(7+8)

8. (a) Explain the process of quick sort on the data 44 33 11 55 77 90 40 60 99 22 88.

- (b) Write the algorithm for PUSH and POP operations on stack.

(8+7)

9. (a) Define and explain graph traversal. Describe in detail various graph traversal strategies with the help of example.

- (b) What is minimum - cost spanning tree ? Discuss Prim's algorithm with example

(8+7)

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SPACE FOR ROUGH WORK

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