No. of Printed Pages : **8**

A5-R5 : Data Structure through Object Oriented Programming Language

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 respects.

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 From where does the insertion and deletion of elements get accomplished in Queues ?

(A) Front and Rear ends respectively

(B) Rear and Front ends respectively

(C) Only Front ends

(D) Only Rear ends

1.2 If the address of A[1][1] and A[2][1] are 1000 and 1010 respectively and each element occupies 2 bytes then the array has been stored in _____ order.

(A) row major

(B) column major

(C) matrix major

(D) None of these

1.3 If a node in a BST (Binary Search Tree) has two children, then its inorder predecessor has :

(A) no left child

(B) no right child

(C) two children

(D) no child

1.4 In worst case, the order of time complexity of Quick sort is :

(A) $O(n \log n)$

(B) $O(n^2)$

(C) $O(\log n)$

(D) $O(n^{24})$

1.5 The maximum degree of any vertex in a simple graph with n vertices is :

(A) $n-1$

(B) $n+1$

(C) $2n-1$

(D) n

1.6 A full binary tree with n leaves contain :

(A) $n-1$ nodes

(B) logn nodes

(C) $2n-1$ nodes

(D) 2n nodes

1.7 When a child class is inherited traits from more than one parent class, this type of inheritance is called _____ inheritance.

(A) Hierarchical

(B) Hybrid

(C) Multilevel

(D) Multiple

1.8 _____ is the OOP feature and mechanism that binds together code and the data it manipulates, and keep both safe from outside world.

(A) Data Binding

(B) Data Encapsulation

(C) Data Storing

(D) Data Abstraction

1.9 In context of time-complexity, find the odd one out :

(A) Deletion from Linked List.

(B) Searching in Hash Table

(C) Adding edge in Adjacency Matrix

(D) Heapify a Binary Heap

1.10 If the array is already sorted, which of these algorithms will exhibit the best performance ?

(A) Merge Sort

(B) Insertion Sort

(C) Quick Sort

(D) Heap Sort

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 Array elements can be accessed and modified only at the ends of the array while any element of the stack can be accessed or modified randomly through their indices.

2.2 The time complexity of linear search is O(n).

2.3 The expressions arr and &arr are same for an array of 10 integers.

2.4 A linked list creates order through the use of pointers that link one element to another.

2.5 A full binary tree has a restricted shape which starts at the root and fills the tree by levels from left to right.

2.6 Big Theta ($\ominus$) indicates that the Upper and Lower bounds of an algorithm are the same.

2.7 A preorder traversal visits every node starting at the leaf nodes and working up the tree.

2.8 A binary tree traversal that lists every node in the tree exactly once is called an enumeration.

2.9 Tree is a finite set of one or more nodes such that there is one designated node called the root.

2.10 The list of children approach uses both pointers and an array structure to represent the tree.

SPACE FOR ROUGH WORK

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	breadth-first search	**A**	Random Traversal
3.2	Time Complexity	**B**	Linear Traversal
3.3	sorting	**C**	How long does it take to find a solution
3.4	Array	**D**	Polymorphism
3.5	Linked list	**E**	Inheritance
3.6	Preorder is	**F**	Binary search
3.7	++i is equivalent to	**G**	depth first order
3.8	O log(n)	**H**	heap
3.9	A graph with one or more edges	**I**	2-chromatic
3.10	Merge sort uses	**J**	1-chromatic
		K	Divide and conquer strategy
		L	Graph traversal
		M	i = i + 1

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.	nlogn	**B.**	Insertion sort	**C.**	sorted	**D.**	adjacency
E.	post order	**F.**	LIFO	**G.**	new	**H.**	merge sort
I.	BFS	**J.**	Stack	**K.**	cost	**L.**	DFS
M.	Class						

4.1 _____ data structure is needed to convert infix notations to postfix notations.

4.2 In _____ traversal, the root node is visited last.

4.3 A Stack, in other words, is called a _____ list.

4.4 The weight or value of an edge is also called _____

4.5 In _____ shortest path can be found.

4.6 The _____ method is optimal because the sorted array is developed without using any extra space.

4.7 Binary Search is the Fastest of all methods for _____ records.

4.8 The Worst-case time complexity of Merge Sort _____.

4.9 _____ is used to dynamically allocate memory.

4.10 An _____ matrix representation of a graph cannot contain information of parallel edges.

PART - TWO

(Answer any FOUR questions)

5. (a) Write a C++ Program for performing insertion and display operations in array.

(b) Sort the following number in ascending order using Insertion sort.

4, 3, 2, 10, 12, 1, 5, 6.

Write the output after each iteration.

(7+8)

6. (a) What are the advantages of linked list over arrays ? Implement Doubly Circular Linked List and insert an element at a given position in this linked list.

(b) Write a C++ program to implement a linear queue using Stack.

(c) For the given 2D array (integer) of order 15×10 whose base address is 1500, find the address of the location A[12][9] for the row major order and column major order.

(5+4+6)

7. (a) Evaluate the expression

8 2 3 ^ / 2 3 * + 5 1 * - by using stack.

(b) Illustrate the Queue operations using C++ program.

(7+8)

8. (a) Construct a binary tree whose nodes in inorder and preorder are given as follows :

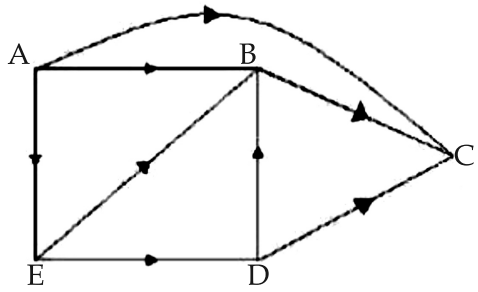
Inorder : 10, 15, 17, 18, 20, 25, 30, 35, 38, 40, 50

Preorder : 20, 15, 10, 18, 17, 30, 25, 40, 35, 38, 50

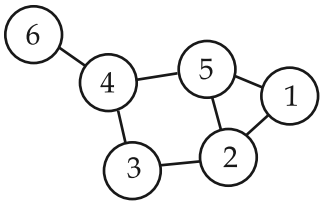
(b) What are B-trees ? Construct a B-Tree of order 3 for the following set of Input data : 5, 9, 3, 7, 1, 2, 8, 6, 0, 4.

(8+7)

9. (a) What are the different ways of representing a graph? Represent the following graph using those ways.



(b) Explain BFS and DFS by considering following graph.



(8+7)

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