No. of Printed Pages : **8**

A5-R5.1 : 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)

Data Structure Through Object Oriented Programming Language

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 Concept of Overloading relates to which Object oriented feature-

(A) Encapsulation

(B) Abstraction

(C) Inheritance

(D) Polymorphism.

1.2 What will be the output of following code in C++ ?

```
#include <iostream>
#include <string>
using namespace std;
int main()
{
    char str1[6] = "Happy";
    char str2[9] = "Birthday";
    char str3[15] = str1+ " " + str2;
    cout<<str3;
    return 0;
}
```

(A) HappyBirthday

(B) Error

(C) Happy Birthday

(D) Birthday

1.3 What is the complexity of Binary Search in best case scenario-

(A) O(1)

(B) O(log N)

(C) $O(n^2)$

(D) O(n log n)

1.4 Which algorithm follows the Divide and Conquer Strategy ?

(A) Bubble Sort

(B) Heap

(C) Quicksort

(D) All the above

1.5 Which statement is not true about Arrays ?

(A) Arrays are homogenous in nature

(B) Arrays are dynamic in nature

(C) Array elements are stored in contiguous memory

(D) Arrays are also called as subscripted variable

1.6 Values on the stack can be removed from :

(A) anywhere

(B) bottom position

(C) top position

(D) value cannot be removed

1.7. An algorithm that calls itself directly or indirectly is known as :

(A) Sub algorithm

(B) Recursion

(C) Polish notation

(D) Traversal algorithm

1.8 Which traversal method lists the nodes of binary search tree in ascending order ?

(A) post-order

(B) in-order

(C) Pre-order

(D) None of the above

1.9 Which Data Structure is used in implementation of Quicksort ?

(A) stack

(B) set

(C) tree

(D) queue

1.10 Graph can be represented using :

(A) Adjacency Matrix

(B) Incidence Matrix

(C) Linklist

(D) Both (A) and (B)

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 Function malloc returns a pointer of type void * to the memory it allocates. If it is unable to allocate memory, it returns a NULL pointer.

2.2 Following are the steps for a post order traversal of a binary tree.
Traverse the right subtree in post order
Traverse the left subtree in post order
Process the value in the node

2.3 The initial state of queue is w,x,y,z (where 'w' is at the front). The number of additions and deletions required for the final state of queue as z,y,x,w are 3 deletions and 3 additions.

2.4 The order of Binary Search algorithm is log(n).

2.5 In Doubly linklist insertion of a node at the beginning involved modification of three pointers.

2.6 BFS uses Queue Data Structure.

2.7 Linklist are not dynamic in nature.

2.8 A spanning tree consists of (n-1) edges, where 'n' is the number of vertices (or nodes).

2.9 We can use operator ":" to access the overridden function in C++.

2.10 Multiple inheritance leads to ambiguity problem.

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	This is used to hide the values or state of a structured data object inside a class, preventing unauthorized parties' direct access to them.	**A**	Destructor
3.2	Through this a programmer hides all but the relevant data about an object in order to reduce complexity and increase efficiency.	**B**	Overflow
3.3	It is an instance member function that is invoked automatically whenever an object is going to be destroyed	**C**	encapsulation
3.4	It is known as half-interval search, logarithmic search, It is a search algorithm that finds the position of a target value within a sorted array.	**D**	Binary Search
3.5	a linear data structure where the insertion and deletion operations are performed from both ends.	**E**	Dequeue
3.6	A tree that maintains the predecessor and successor node of every node in the tree	**F**	B-Tree
3.7	This algorithm is a recursive algorithm that uses the idea of backtracking.	**G**	BFS
3.8	The condition when no more values are allowed to add to the Stack	**H**	Abstraction
3.9	The linear data structure that is dynamic in nature and allow easy insertion and deletion of the elements.	**I**	Linked list
3.10	The graph in which from each node there is an edge to each other node.	**J**	Connected graph
		K	Complete graph
		L	DFS
		M	threaded binary tree

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.	Abstract Data Type	**B.**	Bubble Sort	**C.**	Constructors	**D.**	Primitive Data Type
E.	Directed Acyclic Graph (DAG)	**F.**	Singly Linklist	**G.**	Selection Sort	**H.**	Inheritance
I.	Enqueue	**J.**	Balanced	**K.**	Complete acyclic Graph	**L.**	Complete
M.	Insertion sort						

4.1 The concept of moving from generalization to specialization is _____.

4.2 _____ are used to initialize an object.

4.3 _____ is a mathematical model for data types, defined as per the user needs.

4.4 The best case complexity of _____ is O(n).

4.5 The best case complexity of _____ is $O(n^2)$ for already sorted array.

4.6 A _____ binary tree is a binary tree in which every level, except possibly the last, is filled.

4.7 A _____binary tree is such where height of left and right subtree differ by +1 or -1.

4.8 The single node of _____ consists of data part and pointer to the next node.

4.9 A _____ is a directed graph with no directed cycles.

4.10 _____ operation adds the data value at the rear end of Queue.

PART - TWO
(Answer any FOUR questions)

5. (a) Write a program that will create an Employee class with following data members -
Empid
Empname
Salary
The class should have one parameterized constructor to initialize the data members values and one Function to display the data members value.
Create an object of Employee class and display its data members value.

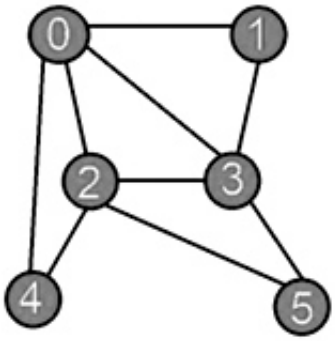
(b) Write a complete program for implementing Queue. The program should demonstrate the overflow and underflow situation of Queue. **(7+8)**

6. (a) Differentiate between Internal and External Sorting. Write down the algorithm for Selection Sorting.

(b) Explain the concept and types of Inheritance with respect to C++. Demonstrate Multilevel Inheritance with example. **(7+8)**

7. (a) Write down the algorithm for the following -
(i) Insertion of element at beginning in Singly Linklist
(ii) Deletion of an element from any position in Singly Linklist

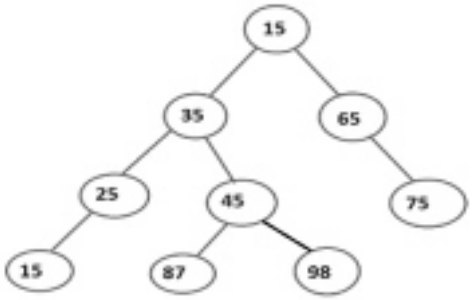
(b) Create and Adjaceny Matrix for the given graph -



(10+5)

8. (a) What is Stack and how it works ? Explain it's characteristics and explain it's use to convert the following infix expression into postfix expression- $(a+b-c-d)*(e+f/d)$.

(b) Write down the recursive algorithm for the Binary Tree Traversal. For the given tree mention the Post Order Traversal Pattern. **(7+8)**



9. (a) Construct a B-Tree of Order 3 by inserting numbers from 1 to 10.

(b) The order of Binary tree in Inorder and Preorder traversals are as under :

Inorder : DGBAHEICF

Proorder : ABDGCEHIF

Draw the corresponding Binary Tree- **(8+7)**

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SPACE FOR ROUGH WORK

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