A6-R4 / B2.1-R4 : DATA STRUCTURE THROUGH C++

ओएमआर शीट सं. :
OMR Sheet No. :

रोल नं. :
Roll No. :

उत्तर-पुस्तिका सं. :
Answer Sheet No. :

परीक्षार्थी का नाम :
Name of Candidate : _____

परीक्षार्थी के हस्ताक्षर :
;Signature of Candidate : _____

परीक्षार्थियों के लिए निर्देश :

Instructions for Candidate :

कृपया प्रश्न-पुस्तिका, ओएमआर शीट एवं उत्तर-पुस्तिका में दिये गए निर्देशों को ध्यानपूर्वक पढ़ें।	Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.
प्रश्न-पुस्तिका की भाषा अंग्रेजी है। परीक्षार्थी केवल अंग्रेजी भाषा में ही उत्तर दे सकता है।	Question Paper is in English language. Candidate can answer in English language only.
इस मॉड्यूल/पेपर के **दो भाग** हैं। **भाग एक** में **चार** प्रश्न और **भाग दो** में **पाँच** प्रश्न हैं।	There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
भाग एक ''वैकल्पिक'' प्रकार का है जिसके कुल अंक 40 है तथा **भाग दो** ''व्यक्तिपरक'' प्रकार का है और इसके कुल अंक 60 है।	**PART ONE** is Objective type and carries 40 Marks. **PART TWO** is Subjective type and carries 60 Marks.
भाग एक के उत्तर, **ओएमआर उत्तर-पुस्तिका** पर ही दिये जाने हैं। **भाग दो** की उत्तर-पुस्तिका में **भाग एक** के उत्तर **नहीं** दिये जाने चाहिए।	**PART ONE** is to be answered in the **OMR ANSWER SHEET** only. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.
भाग एक के लिए अधिकतम समय सीमा **एक घण्टा** निर्धारित की गई है। **भाग दो** की उत्तर-पुस्तिका, **भाग एक** की उत्तर-पुस्तिका जमा कराने के पश्चात् दी जाएगी। तथापि, निर्धारित एक घंटे से पहले **भाग एक** पूरा करने वाले परीक्षार्थी **भाग एक** की उत्तर-पुस्तिका निरीक्षक को सौंपने के तुरंत बाद, **भाग दो** की उत्तर-पुस्तिका ले सकते हैं।	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.
परीक्षार्थी, उपस्थिति-पत्रिका पर हस्ताक्षर किए बिना और अपनी उत्तर-पुस्तिका, निरीक्षक को सौंपे बिना, परीक्षा हॉल/कमरा नहीं छोड़ सकते हैं। ऐसा नहीं करने पर, परीक्षार्थी को इस मॉड्यूल/पेपर में अयोग्य घोषित कर दिया जाएगा।	**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.**
प्रश्न-पुस्तिका को खोलने के निर्देश मिलने के पश्चात् एवं उत्तर लिखना आरम्भ करने से पहले उम्मीदवार जाँच कर यह सुनिश्चित कर लें कि प्रश्न-पुस्तिका प्रत्येक दृष्टि से संपूर्ण है।	After receiving the instruction to open the booklet and before starting to answer the questions, the candidate should ensure that the Question Booklet is complete in all respect.

जब तक आपसे कहा न जाए, तब तक प्रश्न-पुस्तिका न खोलें।
DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

PART ONE
(Answer all the questions)

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 In linked list each node contains minimum of two fields. One field is data field to store the data second field is ?
   (A) Pointer to character
   (B) Pointer to integer
   (C) Pointer to node
   (D) Node

1.2 Linked lists are not suitable for the implementation of _____.
   (A) Insertion sort
   (B) Radix sort
   (C) Polynomial manipulation
   (D) Binary search

1.3 What does 'stack underflow' refer to ?
   (A) Accessing item from an undefined stack
   (B) Adding items to a full stack
   (C) Removing items from an empty stack
   (D) Index out of bounds exception

1.4 What is the complexity of searching for a particular element in a Singly Linked List ?
   (A) O(n)
   (B) O(1)
   (C) logn
   (D) nlogn

1.5 What is the time complexity of enqueue operation ?
   (A) O(logn)
   (B) O(nlogn)
   (C) O(n)
   (D) O(1)

1.6 In linked list implementation of a queue, the important condition for a queue to be empty is :
   (A) FRONT is null
   (B) REAR is null
   (C) LINK is empty
   (D) FRONT==REAR-1

1.7 What is the space complexity of the post-order traversal in the recursive fashion ? (d is the tree depth and n is the number of nodes)
   (A) O(1)
   (B) O(nlogd)
   (C) O(logd)
   (D) O(d)

1.8 To obtain a prefix expression, which of the tree traversals is used ?

(A) Level-order traversal

(B) Pre-order traversal

(C) Post-order traversal

(D) In-order traversal

1.9 Which of the following pair's traversals on a binary tree can build the tree uniquely ?

(A) post-order and pre-order

(B) post-order and in-order

(C) post-order and level order

(D) level order and pre-order

1.10 What can be the applications of Depth First Search ?

(A) For generating topological sort of a graph

(B) For generating strongly connected components of a directed graph

(C) Detecting cycles in the graph

(D) All of the mentioned

2. **Each statement below is either TRUE or FALSE. Choose the most appropriate one and ENTER in the "OMR" answer sheet supplied with the question paper, following instructions therein.**

(1x10)

2.1 Inheritance is the process by which object of one class acquire properties of object of another class.

2.2 Height of a Complete Binary Tree that contains n elements is log(n).

2.3 A tree having larger data than root in right sub tree and smaller data in left sub tree is called as AVL Tree.

2.4 A graph in which each arc is associated with a number is called Weighted graph.

2.5 One of the techniques of dealing with the hash collision is Chaining.

2.6 A path from a node to itself is called as a cycle.

2.7 After creating a linked list's head pointer, one should make sure it points to NULL before using it in any operations.

2.8 Friend functions have access only to public members of the class.

2.9 In C++, class members are public by default.

2.10 In C++, using operator overloading we can invent new operators.

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	To provide only essential information to the outside world and hiding their background details	**A.**	Identifier
3.2	Minimum Spanning Tree Algorithm	**B.**	Stack
3.3	In C++, a keyword cannot be used as	**C.**	Compile time
3.4	LIFO	**D.**	probabilistic directed
3.5	A _____ graph is one in which a probability function associates a probability with each arc.	**E.**	$O(n^2)$
3.6	A Tree is a _____ type of Data Structure.	**F.**	Data Abstraction
3.7	FIFO	**G.**	Encapsulation
3.8	In C++ two types of polymorphism is : Runtime and _____.	**H.**	Kruskal's
3.9	Time complexity of Bubble Sort	**I.**	Queue
3.10	Process of combining data members and functions in a single unit.	**J.**	Non-Linear
		K.	Small
		L.	Final
		M.	Denoted acyclic

4. **Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein.** (1x10)

A.	encapsulation	**B.**	Forest	**C.**	Abstraction
D.	n-1	**E.**	Weighted	**F.**	Push
G.	Quick sort	**H.**	Tree	**I.**	Sequential
J.	Internal	**K.**	Predecessors	**L.**	External
M.	O(nLogn)				

4.1 _____ may be defined as a forest in which only a single node has no predecessors.

4.2 In a selection sort of n elements, _____ times the swap function is called in the complete execution of the algorithm.

4.3 A number may be associated with each arc of the graph, such a graph is called _____ graph.

4.4 The Non-leaf nodes of a tree are also known as _____ nodes.

4.5 Overall time complexity of Merge sort is _____.

4.6 _____ is not a stable sorting algorithm in its typical implementation.

4.7 A tree may be defined as a forest in which only a single node has no _____.

4.8 A collection of one or more trees is _____.

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

4.10 _____ type of storage is used to represent stacks and queues.

PART TWO

(Answer any FOUR questions)

5. (a) What is an Array ? Write any two characteristics of an Array. Explain storage representation of one dimensional array. List the operations that can perform on one dimensional array.

(b) What is Data Structure ? Explain the concept of Primitive and Non Primitive Data Structure. List the operations that can be performed on Data Structure. Write any two real life applications of Stack. **(7+8)**

6. (a) List down the application of Queue. Write an Algorithm to insert an element in queue and delete an element from the queue.

(b) What do you mean by an Algorithm ? Explain the Top-down and bottom-up approaches to design an Algorithm. How time complexity and space complexity are helpful to analysis of Algorithm ? **(7+8)**

7. (a) What do you mean by Singly linked list ? List the Operations that can perform on Linked list. Write meaningful differences between Linked list and Sequential list.

(b) What do you mean by Complete Binary Tree ? Explain Pre-order Traversal, In-order Traversal, Post-order Traversal with respect to Binary Search Tree. **(7+8)**

8. (a) What do you mean by Circular Linked List ? Write down the Advantage and disadvantage of Circular Linked List.

(b) What do you mean by tree ? Discuss the following with reference to tree.
(i) In degree
(ii) Out Degree
(iii) Edge
(iv) Weight

(c) Explain prim's algorithm for minimum spanning tree with suitable example. **(5+5+5)**

9. Explain briefly **any three** from the following :

(a) Write an algorithm to Insert a value in Binary Search Tree (BST).

(b) Explain Insertion sort with suitable example.

(c) What is Operator overloading ? Explain its importance with an example.

(d) Write an algorithm for inserting a new node in doubly linked list.
(3x5)

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SPACE FOR ROUGH WORK

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