A6-R4 : DATA STRUCTURE THROUGH C++

अवधि : 03 घंटे **अधिकतम अंक : 100**
DURATION : 03 Hours **MAXIMUM MARKS : 100**

ओएमआर शीट सं. : **OMR Sheet No. :**					

रोल नं. : **Roll No. :** | | | | | | |

उत्तर-पुस्तिका सं. : **Answer Sheet No. :** | | | | | | |

परीक्षार्थी का नाम : **परीक्षार्थी के हस्ताक्षर :**
Name of Candidate : _____; **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 सकते हैं।	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 हैं तथा **भाग दो** ''व्यक्तिपरक'' प्रकार का है और इसके कुल अंक 60 हैं।	**PART ONE** is Objective type and carries 40 Marks. **PART TWO** is Subjective type and carries 60 Marks.
भाग एक के उत्तर, इस प्रश्न-पत्र के साथ दी गई **ओएमआर उत्तर-पुस्तिका** पर, उसमें दिये गए अनुदेशों के अनुसार 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, 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**.
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=10)

1.1 The memory address of the first element of an array is called :

(A) floor address

(B) foundation address

(C) first address

(D) base address

1.2 Which of the following is not the required condition for binary search algorithm ?

(A) The list must be sorted

(B) There should be the direct access to the middle element in any sublist

(C) There must be mechanism to delete and/or insert elements in list

(D) None of the above

1.3 Which of the following data structure can't store the non-homogeneous data elements ?

(A) Arrays

(B) Records

(C) Pointers

(D) None

1.4 A data structure where elements can be added or removed at either end but not in the middle

(A) Linked lists

(B) Stacks

(C) Queues

(D) Deque

1.5 Which of the following is an advantage of adjacency list representation over adjacency matrix representation of a graph ?

(A) In adjacency list representation, space is saved for sparse graphs.

(B) DFS and BSF can be done in O(V+E) time for adjacency list representation. These operations take O(V^2) time in adjacency matrix representation. Here is V and E are number of vertices and edges respectively.

(C) Adding a vertex in adjacency list representation is easier than adjacency matrix representation.

(D) All of the above

1.6 What is common in three different types of traversals (Inorder, Preorder and Postorder) ?

(A) Root is visited before right subtree

(B) Left subtree is always visited before right subtree

(C) Root is visited after left subtree

(D) None of the above

1.7 The inorder and preorder traversal of a binary tree are d b e a f c g and a b d e c f g, respectively. The postorder traversal of the binary tree is :

(A) d e b f g c a

(B) e d b g f c a

(C) e d b f g c a

(D) d e f g b c a

1.8 Which of the following is not a type of constructor ?

(A) Copy constructor

(B) Friend constructor

(C) Default constructor

(D) Parameterized constructor

1.9 Which of the following concepts of OOPS means exposing only necessary information to client ?

(A) Encapsulation

(B) Abstraction

(C) Data hiding

(D) Data binding

1.10 Which is not a sorting technique :

(A) Radix sort

(B) Merge sort

(C) Poll sort

(D) Quick 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=10)**

2.1 The compiler checks the type of reference in the object and not the type of object in Inheritance case.

2.2 All operators can be overloaded in C++.

2.3 Object is an instance of a class.

2.4 Queue is used for breadth first search.

2.5 Binary Search algorithms is NOT an example of using the divide-and-conquer technique.

2.6 Singly Linked List is a type of linked list, where every node stores address of next node in list and the last node has address of the first node.

2.7 Final methods cannot be overridden but overloaded.

2.8 Overloaded methods must have the same return types.

2.9 A data structure is said to be nonlinear if traversal of nodes is nonlinear in nature. Example: Graph and Trees.

2.10 An interface can implement another interface ?

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=10)**

	X		Y
3.1	A variable that can hold the address of the variables, structure and functions that are used in the program	A	Data encapsulation
3.2	Having multiple forms of one thing is known as	B	Inheritance
3.3	A mechanism of bundling the data, and the functions that use them is called	C	AVL Tree
3.4	Quicksort's worst case running time is	D	Stack
3.5	In this traversal method, the left subtree is visited first, then the right subtree and finally the root node	E	Preorder
3.6	The suitable data structure to represent hierarchical relationship between elements.	F	Array
3.7	A Very useful data structure in situation when data have to be stored and then retrieved in reverse order	G	Polymorphism
3.8	A binary search tree whose left subtree and right subtree differ in height by at most 1 unit is called	H	Post-order
3.9	In this traversal method, the left subtree is visited first, then the root and later the right sub-tree	I	O(nlogn)
3.10	A data structure which can hold a fix number of items and these items should be of the same type	J	Tree
		K	$O(n^2)$
		L	In-order
		M	Pointer

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=10)

A.	$O(n^2)$	**B.**	Insertion	**C.**	fixed
D.	O(nlogn)	**E.**	Stack	**F.**	max-heap
G.	Dynamic	**H.**	Queue	**I.**	Polymorphism
J.	Dijkstra's algorithm	**K.**	AVL Trees	**L.**	PUSH
M.	Inheritance				

4.1 The ability to reuse objects already defined, perhaps for a different purpose, with modification appropriate to the new purpose, is referred to as _____.

4.2 The operation for adding an entry to a stack is traditionally called _____.

4.3 The complexity of Bubble sort algorithm is _____.

4.4 _____ sorting algorithm is frequently used when n is small where n is total number of elements

4.5 _____ are variations of Binary Search Trees.

4.6 In _____, a sorted array of edges is required in order to construct a minimal spanning tree.

4.7 The size of the arrays is _____

4.8 _____ is used for breadth first search

4.9 In a _____ the smallest element resides always at the leaves assuming all elements are distinct

4.10 The size of linked lists are _____

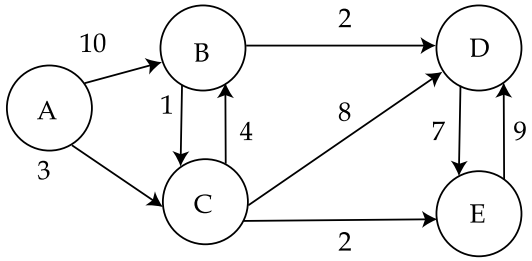
PART TWO

(Answer any FOUR questions)

5. (a) Give postfix of the following infix expression :

A+(B*C – (D/ E^F)*G)*H.

(b) Write Dijkstra algorithm to find the shortest path from given source to destination. Find the shortest path from source A to destination D for the following directed graph using Dijkstra algorithm.



(6+9)

6. (a) Ackerman function is one of a beautiful example of recursion. Compute the Ackerman's number for (3,1).

(b) Create an AVL tree using the following data entered as a sequential set. Show the balance factor in the resulting tree.
10 14 23 33 56 66 70 80

(7+8)

7. (a) With an example explain Shell Sort.

(b) Differentiate between static & dynamic memory allocation ? **(7+8)**

8. (a) Create min heap tree for following data in the sequence :

50 30 40 20 10 25 35 10 5 33 22 8

(b) What is polymorphism in OOPS ? Explain it with an example.

(7+8)

9. (a) What is importance of sparse matrix? Write an algorithm to transpose a given matrix in sparse form.

(b) Explain tail recursion with the help of a suitable example.

(8+7)

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SPACE FOR ROUGH WORK

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