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

अवधि : 03 घंटे
DURATION : 03 Hours

अधिकतम अंक : 100
MAXIMUM MARKS : 100

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 Which of the following is **not** a property of Good Algorithm ?

(A) Finiteness

(B) Deterministic

(C) Non-Ambiguous

(D) Programming Dependent

1.2 Which of the following concepts make extensive use of arrays ?

(A) Binary trees

(B) Scheduling of processes

(C) Spatial locality

(D) Caching

1.3 What is the value of the postfix expression 6 3 2 4 + − * ?

(A) Something between −5 and −15

(B) Something between 15 and 100

(C) Something between 5 and 15

(D) Something between 5 and −5

1.4 Minimum number of queues to implement stack is _____.

(A) 3

(B) 4

(C) 1

(D) 2

1.5 Which of the following is correct with respect to Binary Trees ?

(A) Let T be a Binary Tree. For every $k \geq 0$, there are no more than $2k$ nodes in level k

(B) Let T be a Binary Tree with λ levels. Then T has no more than $2\lambda - 1$ nodes

(C) Let T be a Binary Tree with N nodes. Then the number of levels is at least ceil(log (N + 1))

(D) All of the above

1.6 Given an array of element 5, 7, 9, 1, 3, 10, 8, 4. Tick all the correct sequences of elements after inserting all the elements in a min-heap

(A) 1, 3, 4, 7, 8, 9, 10

(B) 1, 4, 3, 8, 9, 5, 7, 10

(C) 1, 3, 4, 5, 8, 7, 9, 10

(D) None of the above

1.7 Depth First Search is equivalent to which of the Traversal in the Binary Trees ?

(A) Pre-order Traversal

(B) Post-order Traversal

(C) Level-order Traversal

(D) In-order Traversal

1.8 Topological Sort can be applied to which of the following graphs ?

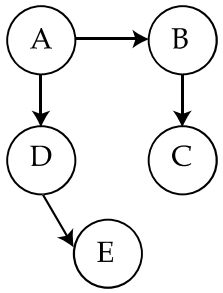
(A) Undirected Cyclic Graphs

(B) Directed Cyclic Graphs

(C) Directed Acyclic Graphs

(D) Undirected Acyclic Graphs

1.9 What would be the DFS Traversal of the given Graph ?



(A) ABCDE

(B) AEDCB

(C) EDCBA

(D) ADECB

1.10 In simple chaining, what data structure is appropriate ?

(A) Singly linked list

(B) Doubly linked list

(C) Circular linked list

(D) Binary trees

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 Recursion is a repetitive process in which an algorithm calls another algorithm.

2.2 Dequeue is the operation which is used to delete element from queue from rear end.

2.3 Quick Sort is example of divide and conquer approach.

2.4 Primary Clustering occurs in the Double Hashing Method.

2.5 A Binary Search can only be applied to sorted record.

2.6 Searching is more efficient in Binary Search Trees than in AVL Trees.

2.7 Breadth First Search uses Queue as a Data Structure.

2.8 The Sequential Search Method on sorted lists is faster than the Indexed Method.

2.9 Searching is more efficient in B-trees than in Binary Search Trees.

2.10 Bubble Sort is so named because it bubbles the smallest element to the middle of the array.

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	Insertion Sort	**A.**	Knapsack Problem
3.2	Quick Sort	**B.**	Hashing
3.3	Stable Sort	**C.**	Prim's Algorithm
3.4	Hierarchical relationship between elements	**D.**	O(n)
3.5	Greedy approach	**E.**	Tree
3.6	Recursion	**F.**	Stack
3.7	Binary Search	**G.**	Divide and Conquer
3.8	Connected Minimum Spanning tree	**H.**	O(log n)
3.9	Random Search possible	**I.**	Merge Sort
3.10	Collision	**J.**	Kruskal's Algorithm
		K.	Heap Sort
		L.	Array
		M.	Linked List

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.	Heap Data Structure	**B.**	Copy Constructor	**C.**	New
D.	Stack	**E.**	Run-time Exception	**F.**	Parameterize Constructor
G.	Null Exception	**H.**	2^n	**I.**	Non-Linear Data Structure
J.	Reusability	**K.**	$2^n - 1$	**L.**	Shortest-Path Algorithm
M.	Bubble				

4.1 In a Complete Binary Tree of 'n' levels, there are _____ non-leaf nodes.

4.2 _____ Sort is not an example of using the divide-and-conquer technique.

4.3 _____ Data Structure is used in a Depth First Search.

4.4 A _____ performs the copying for value returns as well as for value parameters.

4.5 A Graph is _____.

4.6 _____ is advantage of Inheritance.

4.7 Global Variables are stored in _____ Data Structure.

4.8 Run-time or Dynamic allocation of memory may be done using the C++ operator _____.

4.9 _____ algorithm might be used to find the best sequence of connections from one city to another.

4.10 The new operator throws a _____ when heap is exhausted.

PART TWO

(Answer any FOUR questions)

5. (a) What do you mean by term Data Structure ? Explain the basic operation performed by Data Structure.

(b) Define Algorithm with suitable example. Also discuss what are the good characteristics of Algorithm.

(c) Explain the term Asymptomatic Notation. Discuss various types of Asymptomatic Notation. **(6+4+5)**

6. (a) Define the term Recursion. Write a program Recursive and Non-recursive Program in C++ to calculate factorial of a number.

(b) Discuss Stack Data Structure and its various operations. Also describe the method of postfix expression evaluation with suitable example.

(c) Write short notes on :

(i) Deque

(ii) Priority Queue **(6+5+4)**

7. (a) Explain the construction of Binary Tree from infix and postfix traversal with suitable example.

(b) Write C++ program for Insertion Sort.

(c) Explain the following terms :

(i) Binary Search Tree

(ii) Complete Binary Tree **(6+5+4)**

8. (a) Write pseudo code for Merge Sort Algorithm. Also Discuss the recurrence Relation for its time complexity in best, average and worst case.

(b) Elaborate Kruskal's Algorithm for finding Minimum Spanning Tree with suitable example. **(7+8)**

9. (a) What is the purpose of Hashing ? Describe any one method of handling collision in Hashing technique.

(b) What is Breadth First Search ? Write the pseudo code for BFS Traversal.

(c) Discuss application of Depth First Search. **(5+6+4)**

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SPACE FOR ROUGH WORK

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