Maulana Abul Kalam Azad University of Technology, West Bengal

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BCA-302

DATA STRUCTURE WITH C

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The most appropriate matching for the following pairs :

X.	Bubble Sort	1. $O(\log_2 n)$
Y.	Linear Search	2. $O(n^2)$
Z.	Binary Search	3. $O(n)$.

	X	*Y*	*Z*
a)	1	2	3
b)	3	1	2
c)	3	2	1
d)	2	3	1.

ii) The best data structure to evaluate an arithmetic expression (in postfix form) is

a) queue b) stack

c) tree d) linked list.

iii) The tree traversal technique in which the root is traversed after its children is known as

a) post-order traversal

b) pre-order traversal

c) in-order traversal

d) none of these.

iv) Let *q* be the queue of integers defined as follows :

```
# define MAX 10
struct queue
{ int data [MAX] ;
int rear, front ;
} q ;
```

To insert an element into the queue, we may write operation

a) ++ *q*.data [*q*.rear] = *x* ;

b) *q*.data [*q*.rear] ++ = *x* ;

c) *q*.data [++*q*.rear] = *x* ;

d) none of these.

v) A linear collection of data elements where the linear node is given by means of pointer is called

a) linked list b) node list

c) tree d) none of these.

vi) Adjacency matrix for an undirected graph is

a) unit matrix

b) symmetric matrix

c) asymmetric matrix

d) none of these.

vii) An adjacency matrix representation of a graph cannot contain information of

a) Nodes

b) Edges

c) Direction of edges

d) Parallel edges.

viii) Which of the following data structures may give overflow error, even though the current number of elements in it, is less than its size ?

a) Simple queue

b) Circular queue

c) Stack

d) None of these.

ix) Number of possible binary trees with 4 node is

a) 14 b) 34

c) 24 d) none of these.

x) Number of nodes in a complete binary tree of depth k is

a) $2k$ b) 2^k

c) $2^k - 1$ d) none of these.

xi) Time complexity of insertion sort algorithm in the best case is

a) $O(n)$ b) $O(n \log_2 n)$

c) $O(n^2)$ d) none of these.

xii) The following sequence of operations is performed on a stack :

push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.

The sequence of popped values is

a) 2, 2, 1, 2, 1 b) 2, 2, 1, 1, 2

c) 2, 1, 2, 2, 1 d) 2, 1, 2, 2, 2.

xiii) Which of the following traversal techniques lists the nodes of binary search tree in ascending order ?

a) Post-order b) In-order

c) Pre-order d) None of these.

xiv) The most appropriate matching for the following pairs :

X.	First In First Out	1.	Tree
Y.	Depth First Search	2.	Queue
Z.	In-order Traversal	3.	Graph.

	X	*Y*	*Z*
a)	1	2	3
b)	3	1	2
c)	3	2	1
d)	2	3	1

xv) p is a pointer to a structure. A member x of that structure is referenced by

a) $(*p).x$ b) $p \rightarrow x$

c) $*(p.x)$ d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *five* of the following. $5 \times 3 = 15$

2. What do you mean by 'Abstract Data Type' ? Explain with an example.
3. What are the advantages of linked list over array ?
4. What is stack ? Explain with an example.
5. How is a binary tree different from binary search tree ?
6. Write an algorithm/C-function for preorder traversal of a binary tree.

7. How does binary search give benefit over linear search ?

8. What will be the complexity (best case) for the following operations ?

9. What are the uses of Depth First Search ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

10. a) What is a linked list ? What are its advantages over arrays ? Also state its disadvantage over array. 2 + 2 + 2

    b) Write a *C*-function to delete a node from a given linked list. 6

    c) What are the advantages of doubly linked list over singly linked list ? 3

11. a) Write a *C*-function to implement 'push' and 'pop' operations in a stack. 4 + 4

    b) What is a circular queue ? What advantage do we get from circular queue over ordinary queue ? 4 + 3

12. a) Convert the following infix expression to corresponding postfix expression : 7

    $4 + 3 * 10 / 6 + 7 - 4 / 2 + 5 \wedge 3$

    b) Write a complete *C* program or algorithm for insertion sort. 8

13. a) What is binary search tree ? 2

b) Construct the binary search tree if the elements are in the order : 4

60, 75, 25, 66, 50, 55, 45, 40, 35, 57, 30

c) Delete the following nodes in order and show each step : 2 + 2 + 2

i) Node with 55

ii) Node with 66

iii) Node with 50.

d) Consider the following sequence of a binary tree traversals :

Inorder : B C E D F A G H

Preorder : A B C D E F G H

Construct the tree. 3

14. Write short notes on any *three* of the following : 3 × 5

a) Graph and their representation in computer

b) Non-linear data structure

c) Quick sort

d) Breadth first search

e) Prim's Algorithm.