Maulana Abul Kalam Azad University of Technology, West Bengal

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BCA-302

PUID : 03159 (To be mentioned in the main answer script)

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) What are the applications of dequeue ?

   a) A-Steal job scheduling algorithm

   b) Can be used as both stack and queue

   c) To find the maximum of all sub-arrays of size k

   d) To avoid collision in hash tables.

ii) Consider the following doubly linked list : head-1-2-3-4-5-tail. What will be the list after performing the given sequence of operation ?

```
Node temp= new Node (6, head, head.getNext());
Node templ= new Node (0, tail.getPrev (), tail);
headsetNext (temp);
tempgetNext (). setPrev (temp);
tailsetPrev (templ);
templgetPrev().setNext (templ);
```

a) head-0-1-2-3-4-5-6-tail
b) head-1-2-3-4-5-6-tail
c) head-6-1-2-3-4-5-0-tail
d) head-0-1-2-3-4-5-tail.

iii) Which of the following is not an application of priority queue ?

a) Huffman codes
b) Interrupt handling in operating system
c) Undo operation in text editors
d) Bayesian spam filter.

iv) Entries in a stack are "ordered". What is the meaning of this statement ?

a) A collection of stacks is sortable
b) Stack entries may be compared with the '<' operation
c) The entries are stored in a linked list
d) There is a Sequential entry that is one by one.

v) The concatenation of two lists can performed in O(1) time. Which of the following variations of linked list can be used ?

a) Singly linked list
b) Doubly linked list
c) Circular doubly linked list
d) Array implementation of list.

vi) Consider the usual algorithm for determining whether a sequence of parentheses is balanced. Suppose that you run the algorithm on a sequence that contains 2 left parentheses and 3 right parentheses (in some order). The maximum number of parentheses that appear on the stack AT ANY ONE TIME during the computation ?

a) 1 b) 2
c) 3 d) 4 or more.

vii) In Linked List implementation, a node carries information regarding

a) Data b) Link
c) Data and Link d) Node.

viii) What would be the asymptotic time complexity to add a node at the end of singly linked list, if the pointer is initially pointing to the head of the list ? Assume the list contains 'n' nodes.

a) $O(1)$ b) $O(n)$
c) $O(n^2)$ d) $O(\log_2 n)$.

ix) Which of the following best describes an array ?

a) A data structure that shows a hierarchical behaviour
b) Container of objects of similar types
c) Arrays are immutable once initialised
d) Array is not a data structure.

x) How do you initialize an array in *C* ?

a) int arr[3] = (1, 2, 3);
b) int arr(3) = { 1, 2, 3 };
c) int arr[3] = { 1, 2, 3 };
d) int arr(3) = (1, 2, 3);

xi) The best data structure that is used to evaluate an arithmetic expression (in postfix form) is

a) queue b) stack
c) tree d) linked list.

[Turn over

xii) Number of threads in a two-way threaded binary tree having 'n' nodes are

a) $n - 1$ b) n

c) $n + 1$ d) none of these.

GROUP – B
(Short Answer Type Questions)

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

2. List the applications of Stack and Queue.
3. What are the advantages of Linked list over arrays ?
4. What are non-recursive procedures ? Compare recursive and non-recursive procedures. 2 + 3
5. What is the difference between linear and non-linear data structure ?
6. What is threaded binary tree ?

GROUP – C
(Long Answer Type Questions)

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

7. Explain how stack is applied for evaluating an arithmetic expression and write the algorithm. Write an algorithm to insert an element at the specific position in an array. (4 + 6) + 5
8. Write an algorithm to sort an array of integers in the descending order and perform time complexity analysis for the same. Illustrate the concept of breadth-first search traversing of graph. (5 + 4) + 6
9. Write the algorithm for pre-order tree traversal. Also show the steps of this algorithm on an example set of numbers.
10. Write an algorithm to traverse a graph using Depth First Search. Explain Radix sort. 6 + 9
11. Write an algorithm to find minimum and maximum elements from a binary search tree. How are queues represented in memory ? Write their applications. 7 + 5 + 3