

Name :
Roll No. :
Invigilator's Signature :

**CS/B.Tech/BME(O)/SEM-5/CS-502/2012-13
2012**

DATA STRUCTURE AND ALGORITHM

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 the following :

10 × 1 = 10

i) If we evaluate the following postfix expression

23 5 7 * - 12 +

the result will be

- | | |
|-------|---------|
| a) 12 | b) - 12 |
| c) 35 | d) 0. |

ii) 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 out values are

- | | |
|------------------|-------------------|
| a) 2, 2, 1, 1, 2 | b) 2, 2, 1, 2, 2 |
| c) 2, 1, 2, 2, 1 | d) 2, 1, 2, 2, 2. |



iii) Which one is the Pre-order Traversal formula ?

- a) Left-Right-Node
- b) Left-Node-Right
- c) Right-Node-Left
- d) Node-Left-Right.

iv) Insertion of a node after a given node in a doubly Linked List requires

- a) four pointer exchanges
- b) two pointer exchanges
- c) one pointer exchange
- d) no pointer exchange.

v) A vertex of degree one is called

- a) Isolated vertex
- b) NULL vertex
- c) Pendant vertex
- d) Coloured vertex.



vi) The technique of linear probing for collision resolution can lead to

- a) Clustering
- b) Overflow
- c) Underflow
- d) efficient storage utilization.

vii) If a binary tree is threaded for in-order traversal, a right NULL Link, of any node is replaced by the address of its

- a) successor
- b) root
- c) own
- d) predecessor.

viii) Number of small pointer in any binary tree of n nodes is

- a) n
- b) $n + 1$
- c) $n - 1$
- d) none of these.



ix) BFS

- a) scans all incident edges before moving to other vertex
 - b) scans adjacent unvisited vertex as soon as possible
 - c) is same as backtracking
 - d) is same as DFS.
- x) In external sorting methods all data reside in
- a) primary memory
 - b) secondary storage device
 - c) both (a) and (b)
 - d) none of these.

GROUP - B

(Short Answer Type Questions)

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

2. Write an algorithm to insert a node into a non-empty binary search tree.
3. What is Graph ? When will a vertex of a graph be called sink and source ? Describe with an example. $2 + 3$

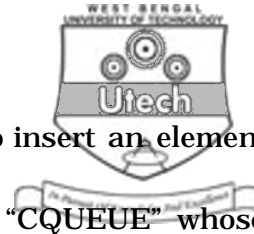


4. Construct a *B*-tree of order 4 with following data :
34, 12, 21, 3, 18, 67, 44, 87, 47, 54, 56, 17, 8, 30, 45, 5, 7.
5. Given below are the pre-order and in-order traversals of a binary tree. Draw the actual tree and write its post-order traversal. 4 + 1
- Pre-order : A B D I F J C F G K
- In-order : D I B E J A F C K G.
6. a) Write a function to reverse the direction of all the Links of a single Linked List. 4
- b) What are the disadvantages of Linear Queue ? 1

GROUP - C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Write an algorithm on Merge sort. 7
- b) What are the best case and worst case complexity of Merge Sort ? 1
- c) Write an algorithm for BFS traversal of a graph. 5
- d) Compare the best case time complexity of selection sort with insertion sort. 2



8. a) What is queue ? Write an algorithm to insert an element "ITEM" into a circular queue named "CQUEUE" whose size is "MAXLEN". 2 + 5
- b) What is 'Double Ended Queue' ? What are the variations of Double Ended Queue ? 2 + 3
- c) What is a 'Priority Queue' ? 3
9. a) Prove that the maximum number of nodes in a binary tree of depth K is $2^K - 1$. 5
- b) Write a C-function to delete 1st node of the doubly Link List. 4
- c) What is Tail recursion ? 2
- d) Prove that the number of degree vertices in a graph is always even. 4



10. a) Write a C-function to insert any node at any position of the Circular Link List. 4
- b) Discuss the advantages of single Linked List over Array. 2
- c) Write down the C-function of Insertion sort. 4
- d) Write an algorithm to insert a node in a binary search tree. 5
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