Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(BME)/SEM-5/CS-502/2011-12

2011

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 : $10 \times 1 = 10$

   i) The best case complexity of insertion sort is

   a) $O(n^2)$ b) $O(n \log_2 n)$

   c) $O(n^3)$ d) $O(n)$.

   ii) In a height balanced tree, height of two sub-trees of every node never differ by more than

   a) 2 b) 0

   c) 1 d) – 1.

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

a) clustering

b) efficient storage utilization

c) overflow

d) underflow.

iv) Inserting a node after a specific node in a doubly linked list requires

a) four pointer exchanges b) two pointer exchanges

c) one pointer exchange d) no pointer exchange.

v) No. of null pointers in any Binary Tree consisting on n nodes is

a) n b) $n + 1$

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

vi) Breadth first search

a) scans all incident edges of a vertex before moving to an another vertex

b) scans adjacent unvisited vertex as soon as possible

c) is same as backtracking

d) is same as depth first search.

vii) Hashing is a method of

a) sorting b) searching

c) inserting d) none of these.

viii) In a B + tree data are stored in

a) intermediate nodes b) leaf nodes

c) any node d) root node.

ix) A node in a directed graph is said to be source, if it has

a) + *ve* outdegree, 0 indegree

b) 0 outdegree, + *ve* indegree

c) 0 outdegree, 0 indegree

d) + *ve* outdegree, + *ve* indegree.

x) Let us consider a function $f(n)$ =

$1888\, n\log n + 500\, n^4 + 0{\cdot}5 \propto 2^n$, we can say that $f(n)$ is

a) $O(n^4)$ b) $O(n\log n)$

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

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 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 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.

   Pre-order : A B D I F J C F G K

   In-order : D I B E J A F C K G. 4 + 1

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 Queu' ? What are the variations of Double Ended Queue ? 2 + 3

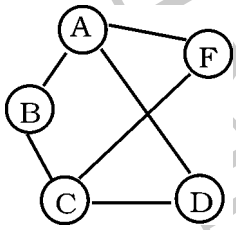
   c) What is 'priority queue' ? 3

9. a) What do you mean by adjacency matrix of a graph ? 2

b) What are Inverted Files structure and Indexed Files structure ? 4

c) Discuss the BFS algorithm with an example. 5

d) Find out the adjacency Matrix of the following graph : 4



10. 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 mode 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

11. 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