Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (FT)/SEM-4/CS-415/2011

2011
DATA STRUCTURE AND ALGORITHMS

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) Linked list is not suitable for

a) sorting b) binary search

c) tree representation d) stack.

ii) The in-order and pre-order traversals of a binary tree are D B E A F C G and A B D E C F G, respectively. The post-order traversal of the binary tree is

a) D E B F G C A b) D E F G B C A

c) E D B G F C A d) E D B F G C A

iii) The following postfix expression with single digit operands is evaluated using a stack :

8 2 3 ^ / 2 3 * + 5 1 *-, where ^ is exponentiation operator. The top two elements after the first * evaluated are

a) 3, 2 b) 6, 1

c) 5, 7 d) 1, 5.

iv) Which of the following sorting algorithm has the best time complexity ?

a) insertion sort b) bubble sort

c) merge sort d) selection sort.

v) Sparse matrices have

a) higher dimension b) many zero entries

c) many non-zero entries d) none of these.

vi) A linear list in which elements are added or removed at either end but not in the middle is called

a) queue b) circular queue

c) deque d) priority queue.

vii) The postfix form of the following prefix :

* + AB – CD is

a) ABC + * – b) AB + * CD –

c) AB + CD–* d) AB + CD*

viii) To implement Depth First Search which of the following is required ?

a) stack b) queue

c) array d) linked list.

ix) The minimum number of edges in a connected cyclic graph of n vertices is

a) $n + 1$ b) $n - 1$

c) n d) $n (n - 1) / 2$.

x) Which of the following algorithms has highest best case time complexity ?

a) merge sort b) heap sort

c) quick sort d) selection sort.

GROUP – B

(Short Answer Type Questions)

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

2. a) Compare doubly link list, circular link list.

b) What is priority queue ? 3 + 2

3. a) What are the conditions for Binary Search algorithm ?

b) What are the advantages and disadvantages of linked list over array ? 2 + 3

4. a) Write the differences between stack and queue.

   b) Indicate the role of different functions associated to stack. 3 + 2

5. a) Define hashing.

   b) Explain collision resolution with chaining.

   c) What is linear probing ? 1 + 2 + 2

6. a) What is a binary search tree ?

   b) Define B-tree.

   c) What is a Height Balanced tree ? 2 + 2 + 1

GROUP – C

(Long Answer Type Questions)

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

7. a) How can the polynomial $6X^6 + 4X^3 - 2X + 10$ be represented by a linked list ?

   b) Construct an AVL tree of the following elements : 1, 5, 6, 2, 8, 11, 20.

   Then insert 10 and 15 from the resultant tree so that the tree remains balanced. Show the balance factors of each node and clearly mention the different rotations.

c) Explain the Quick sort algorthm with a suitable example. Write the best case and worst case time complexity of this sorting algorithm.

3 + (3 + 3) + (5 + 1)

8. a) Write an algorithm to convert an infix expression to its postfix expression using stack.

b) Construct the expression tree of the following expression :

$(5*C+8/Z)+(3*D-2*T)^5$.

c) The order of nodes of a binary tree traversals are given below :

Pre-order : *P B M E S G H I X*

In-order : *M B S E G H I P X*

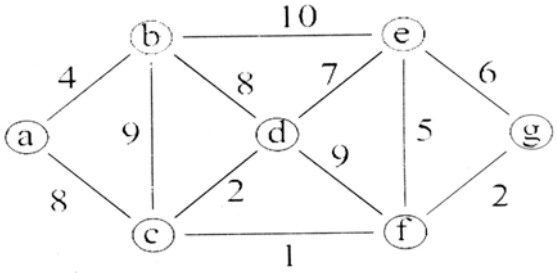
Draw the binary tree. Write its post-order traversal.

5 + 4 + (5 + 1)

9. a) Convert the following infix expression into equivalent postfix expression using Stack :

(*A* + *B* * *C* – (*D* - *E*)) / (*F* + *G* * *H*).

b) What do you mean by minimum cost spanning tree ? What is the minimum cost spanning tree of the given graph using Kruskal's algorithm ?



c) What is adjacency matrix representation of the above graph ? 5 + (2 + 5) + 3

10. a) What is circular linked list and circular queue ?

b) Write the expression to represent a two dimensional array using row major and column order to find the location.

c) Discuss in brief different hash functions.

d) Explain the different cases of deletion of Binary Search Tree with proper example. 4 + 4 + 3 + 4

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

a) Threaded binary tree

b) BFS *vs* DFS

c) Insertion sort

d) Index sequential file organization

e) Binary search tree.