

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1246

Roll No.

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**B.Tech.**

(SEM. III) ODD SEMESTER THEORY

EXAMINATION 2013-14

**DATA STRUCTURES**

Time : 3 Hours

Total Marks : 100

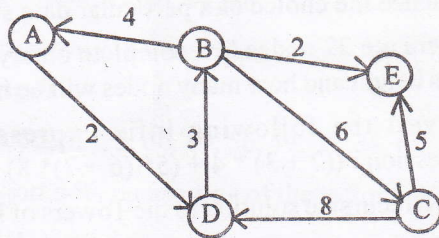
Note :—Attempt all questions.

**SECTION—A**

1. Attempt all parts : (10×2=20)
- How a pointer to a function is declared in 'C' ?
  - What is a Data Structure ? What are the factors that influence the choice of a particular data structure ?
  - If there are 27 nodes in a complete binary tree, what will be its height and how many nodes will be in the last level ?
  - Convert the following infix expression to prefix expression :  $((2 + 3) * 4 + (5 * (6 + 7) * 8) + 9)$ .
  - Give a recursive solution to the Towers of Hanoi problem.
  - What do you understand by activity network ? Explain.
  - What are the advantages of B<sup>+</sup> tree over B- Tree ?
  - Define complete graph and connected graph. How a graph is different from a tree ?
  - Obtain addressing formula for an element in three dimensional array represented in column major order.
  - What is a dequeue ? Explain.

### SECTION-B

2. Attempt any three parts : (10×3=30)
- (a) Discuss the representation of polynomial of single variable using linked list. Write 'C' functions to add two such polynomials represented by linked list.
  - (b) Write an algorithm to evaluate postfix expressions using stacks.
  - (c) Differentiate between fixed length and variable length encoding. Draw a Huffman tree for the following symbols whose frequency of occurrence in a msg is stated along with the symbol below :  
A : 15, B : 6, C : 7, D : 12, E : 25, F : 4, G : 6, H : 1, I : 15  
Decode the message 1110100010111011.
  - (d) Write an algorithm for Merge Sort. Show step by step sorting procedure for the following list of elements :  
30, 12, 38, 8, 5, 15, 1, 40.
  - (e) Write Warshall's algorithm for all pair shortest path and find the all pair shortest paths for the graph given :



### SECTION-C

Note:--Attempt all questions. (5×10=50)

3. Attempt any two parts :
- (a) A  $m \times n$  matrix is said to have a saddle point if some entry  $a[i][j]$  is the smallest value in row  $i$  and largest value in column  $J$ . Write C prog. that determines the saddle point if one exists.

- (b) Write a 'C' function that creates a new linear linked list by selecting alternate elements of a given linear linked list.
- (c) Write an algorithm for insertion of an element in a doubly circular linked list.
4. Attempt any two parts :
- (a) Write a C function to delete element from a circular queue implemented using array.
- (b) Give a data structure to implement two stacks in same array. Write C function to implement push operation on both the stacks.
- (c) Illustrate the use of stack to convert the following infix expression to postfix :  $A * (B + C \wedge D) - E \wedge F * (G/H)$ .
5. Attempt any two parts :
- (a) The order of nodes of a binary tree in inorder and post-order traversal are as follows :  
 In-order : B, I, D, A, C, G, E, H, F.  
 Post-order : I, D, B, G, C, H, F, E, A.  
 Draw the corresponding binary tree.
- (b) Write a C function to insert elements in a BST.
- (c) Construct an expression tree for the following algebraic expression :

$$(3a - b) \wedge 2 (4c + 2d) \wedge 3.$$

6. Attempt any two parts :
- (a) Use Prim's algorithm to determine MST for the graph given in fig. 1.

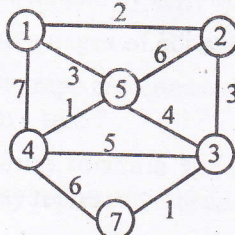


Fig. 1

- (b) Consider the graph given in fig. 2.

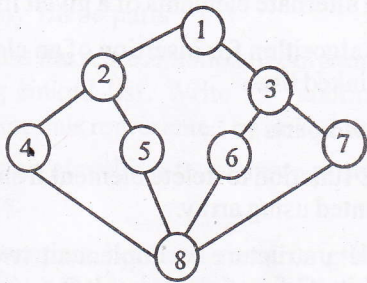


Fig. 2

Perform BFS beginning at vertex 1. List the vertices in which they are visited.

- (c) Write Dijkstra algorithm for finding the shortest path from a source vertex.

7. Attempt any two parts :

- (a) Show step by step creation of a heap for the following elements in the order shown :

25, 57, 48, 37, 12, 92, 86, 33.

- (b) Show the trace of the Quick sort algorithm for the following data :

22, 55, 6, 7, 3, 66, 89, 56, 49, 65, 34, 67.

- (c) Write short note on any one of the following :

- (i) AVL trees
- (ii) Big-oh Notation.