2112
B.E. (Computer Science and Engineering)
Third Semester
CS-301: Data Structures

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I.   Attempt the following:-

   a) What are minimum spanning trees?

   b) Give difference in Polish and Reverse Polish Notation.

   c) Compare BFS and DFS.

   d) Give applications of Topological sort.

   e) How sparse matrices are stored in memory?   (5x2)

UNIT - I

II.   a) Give algorithm for insertion and deletion in doubly linked list.

   b) Write algorithms to perform the following operation using a circular linked list.

   i) To place the elements of the list in increasing order.

   ii) To find the sum of integers and the number of elements in the list.   (2x5)

III.   a) What is Tail recursion? Give tail recursive algorithm for Fibonacci series

   b) Give two ways to represent priority queues in memory. Write algorithm for insertion and deletion in priority queue.   (2x5)

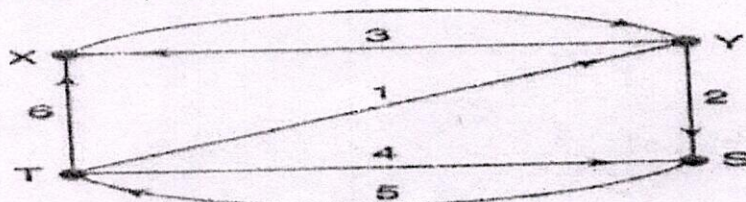IV.   a) Give algorithm for any one of following:

   i)   MERGESORT

   ii) QUICKSORT

   iii) HEAPSORT

   b) Give polish and reverse polish notation representation of the following expressions.

   i) $A \times (B+D)/E-FX (G+H/K)$

   ii) $(A+B \uparrow D)/ (E-F) + G$ (6,4)

UNIT - II

V.   a) Consider the Graph 1, Suppose the nodes are stored in memory in an array DATA as follows: DATA: X, Y,S,T

Graph 1

Find the weight matrix W of Graph 1 and also find the matrix Q of shortest path using Warshall' algorithm.

b) Suppose u and v are distinct nodes in an undirected graph G. Prove if there is a path from u to v, then there is a simple path Q from u to v.   (2x5)

VI.   a) Suppose the following Sequence list the nodes of a binary tree T in Preorder and Inorder, respectively:

Preorder: G, B, Q, A, C, K, F, P, D, E, R, H

Inorder: Q, B, K, C, F, A, G, P, E, D, H, R

Draw the diagram of the tree.

b) Build an AVL tree with the following values: 15, 20, 24, 10, 13, 7, 30, 36, 25 and Delete 20, 24 from it.   (2x5)

VII. a) Suppose a graph is maintained in memory in the form

GRAPH (NODE, NEXT, ADJ, START, DEST, LINK)

Write a procedure which finds the indegree INDEG and outdegree OUTDEG of each node of G.

b) Compare and contrast any one of the following:-

i) File organization techniques

ii) Collision resolution techniques   (2x5)

x-x-x