Course Code : CSTM 41 SUVT/MS – 22 / 2737

Fourth Semester Bachelor of Technology Examination

(Minor)

DATA STRUCTURES AND ALGORITHMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—
    (1)   Make proper assumptions wherever necessary.
    (2)   All questions carry marks as indicated against them.
    (3)   Illustrate answers with examples wherever necessary.

1.   (a)   Explain different types of asymptotic notations to find the time complexity. Also, find the time complexity of the given code using frequency count method :

$x = 1 ;$ $z = 3 ;$
$for(i = 1 ;$ $i < n ;$ $i = i * 2)$
    $for(j = 1 ;$ $j < n ;$ $j{+}{+})$
        $x = x * 4$
        $z = z + 2$ 5 (CO 1)

    (b)   Write an algorithm or C program to insert an element VAL at position POS in the Array A.
Also assume suitable data and show the contents of the array before and after insertion.   5 (CO 1)

2.   (a)   For an array based implementation of stack, write the algorithm to perform the Push and Pop Operations.
Also, show trace of the Stack [with size / MAX = 3] for operations :
push (10), push (2), push (4), peek ( ), push (5), pop ( ), peek ( ), isEmpty ( ).
        5 (CO 2)

    (b)   What is the disadvantage of a linear queue ? Show how this is alleviated using a circular queue ? Justify the answer with an example.   5 (CO 2)

3. (a) Calculate the total sum of the data present in all the nodes of singly linked list. Assume that the list is already created. You may write a C program or an algorithm with example. 5 (CO 2)

OR

(b) Consider a singly linked linear list. Write C - function or algorithm :

(1) To create a list using element insertion at the end and,

(2) To reverse the list without creating a new list. Show appropriate trace of your functions with suitable example. 5 (CO 2)

(c) Write a C program or algorithm to insert a node at the beginning of a circular linked list and show trace for the given elements of in a circular linked list : 10, 50, 60, 80, 90.
Insert 5 at the beginning. 5 (CO 2)

4. (a) Illustrate the procedure to perform insertion sort and perform sorting using insertion sort for the given numbers. Show all intermediate steps :
4   3   2   10   12   1   5   6 5 (CO 3)

(b) Perform sorting using Quick sort for the given numbers. Show all intermediate steps :
54   26   93   17   77   31   44   55   20 5 (CO 3)

5. (a) State the properties of BST and create a Binary Search Tree (BST) using the given nodes :
8   3   6   1   10   7   4   14 5 (CO 4)

(b) Give the in - order, pre - order and post - order traversal for the given BST.
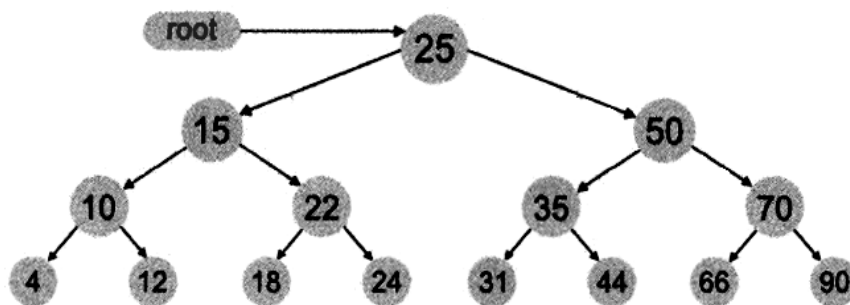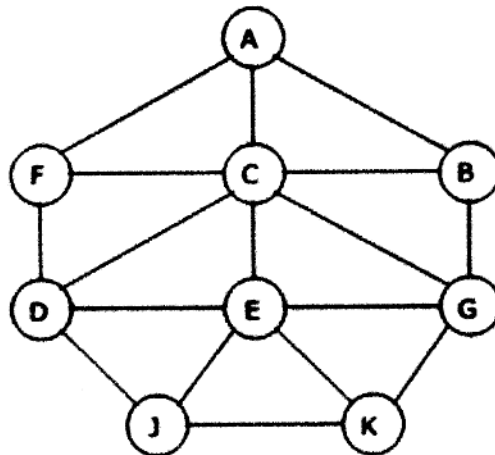

5 (CO 4)

6. Solve any **Two** :—

    (a)   For the given weighted graph, obtain the minimum cost spanning tree of the graph employing Prim's approach. Show the tree at each step.
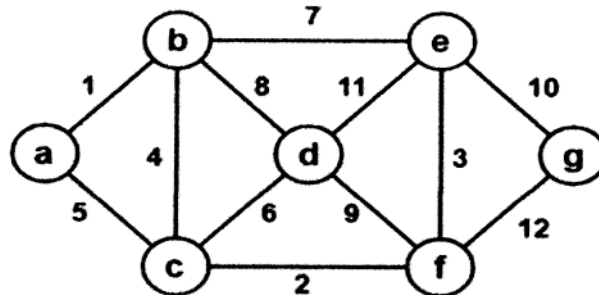
                                                                        5 (CO 4)

    (b)   Assume a table with 8 slots. Hash key = key % table size. Show the insert for following keys :

            36   18   72   43   6   40

        What happens if two keys map to same slot ? Explain one collision avoidance algorithm.   5 (CO 4)

    (c)   Traverse the given graph using Breadth First Search (BFS) and state the complexity of BFS.

                                                                        5 (CO 4)