

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. Sort the array of elements 12, 23, 2, 6, 11, 1, 15, 9 using quick sort (take the last element as the pivot). Show the elements in the array after each pass. Justify your steps. [CO6] [3 marks]

Q2. Write a C function to perform MERGESORT on a given unsorted array of 10 elements. Explain your function with suitable example. [CO6] [3 marks]

Q3. Run Breadth First Search (BFS) on the undirected graph as shown in Figure 1, by using vertex *s* as the source. [CO5] [3 marks]

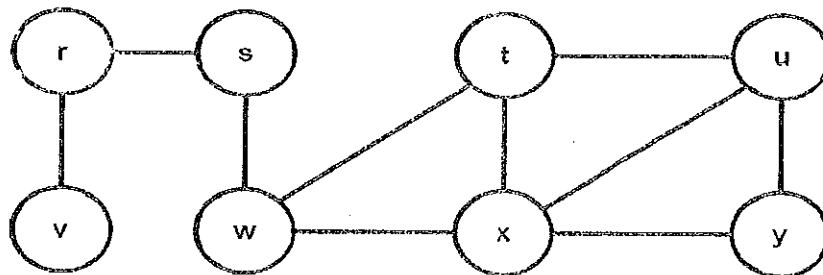


Figure 1

Q4. Represent the Adjacency Matrix, and Adjacency List for the undirected graph as shown in Figure 1. [CO5] [2 marks]

Q5. Construct the binary search tree, if the pre-order traversal of this tree is given by 12, 8, 6, 2, 7, 9, 10, 16, 15, 19, 17, 20. Also, find the post-order traversal of this binary search tree. Justify your steps with intermediate diagrams and discussions. [CO4] [2 marks]

Q6. Suppose we have the following results from performing an in-order and level-order traversal on a binary tree: [CO4] [2 marks]

Inorder : A, W, L, E, T, R

level-order : W, A, T, E, R, L

Construct all trees that are consistent with both traversals or show that no such tree exists. Justify your answer.

Q7. Suppose you have three stacks s_1, s_2, s_3 as provided in Figure 2, with starting configuration shown on the left and finishing condition shown on the right. Give a minimum sequence of push and pop operations that take you from start to finish. For example, to pop the top element of s_1 and push it onto s_3 , you would write $s_3.push(s_1.pop())$. [CO4] [3 marks]

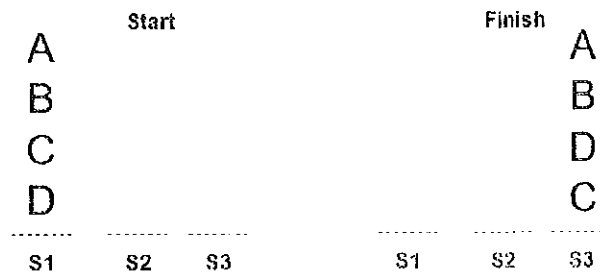


Figure 2

Q8. What order should we insert the elements $\{1, 2, 3, 4, 5, 6, 7\}$ into an empty AVL tree so that we don't have to perform any rotations on it? Justify your answer. [CO5] [3 marks]

Q9. Draw all the rotations that you must perform and the final AVL tree after the elements 1, 10, 5, 7, 3, 13, 6, 4, 8, 9 are inserted in the given order starting from an empty tree. [CO5] [5 marks]

Q10. A letter means put, and an asterisk means get in the below given sequence. Provide the sequence of values returned by the get operation when this sequence of operations is performed on an initially empty FIFO queue. [CO4] [2 marks]

E A S * Y * Q U E * * * S T * * * I O * N * * *

Q11. Which of the following is the least costly way to sort an already sorted array? Justify your answer with suitable discussion. [CO6] [3 marks]

- a. Quicksort
- b. Merge sort
- c. Insertion sort

Q12. Construct a heap from the given array 74, 78, 8, 10, 13, 72, 50, 20 and convert it into max heap. Also find the time complexity of heap sort in the best case, average case, and worst case? Justify your steps. [CO6] [4 marks]