

## ALCCS – OLD SCHEME

Time: 3 Hours

**AUGUST 2012**

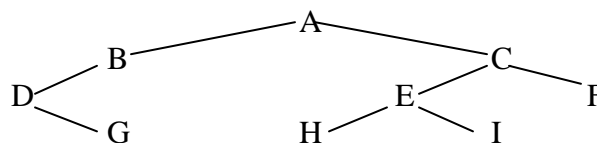
Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**NOTE:**

- Question 1 is compulsory and carries 28 marks. Answer any FOUR questions from the rest. Marks are indicated against each question.
- Parts of a question should be answered at the same place.

- Q.1**
- Explain the concept of asymptotic notations, indicating the normally used notations.
  - How do you declare an array of structures? Explain with example.
  - Convert the following postfix expression into its corresponding infix and prefix expression.  
ABCDE/\*-F/G++
  - List out any two applications of linked list and two advantages of doubly linked lists over singly linked list.
  - Write the results after traversing the tree in inorder, preorder and postorder.



- Discuss the impact of threaded binary tree on the tree traversal procedure.
  - Obtain the optimal Huffman codes for the messages (M1,...,M7) with relative frequencies (q1,...,q7)=(4,5,7,8,10,12,20). Draw the decode tree for this set of codes. (7×4)
- Q.2**
- Define Space Complexity and time complexity. Give reasons for measuring the space and time complexity. Discuss trade-off between time and space complexity. (8)
  - Write an algorithm based on divide and conquer methodology to sort n elements using Quicksort and do the analysis. (10)

- Q.3** a. Explain clearly, with an example, the concepts of the following:  
 (i) Binary tree  
 (ii) Strictly Binary tree  
 (iii) Complete Binary tree (6)
- b. Write a C program to perform the following operations on a doubly linked list.  
 (i) To create the list by adding each node at the front.  
 (ii) Display all the elements in reverse order. (12)
- Q.4** a. Construct the open hash table and closed hash table for the input:  
 30, 20, 56, 75, 31, 19 using the hash function  $h(k) = k \text{ mod } 11$  (6)
- b. Write an algorithm for constructing a Binary Search tree. While constructing the tree take care that duplicate values are not added. Trace the algorithm on the following data.  
 8, 13, 10, 12, 6, 9, 5, 2 (12)
- Q.5** a. Briefly explain the dynamic programming technique using Floyd's algorithm for the problem of all-pairs shortest path as an example. (8)
- b. Explain the concept of greedy method. Consider the Knapsack instance,  
 No. of objects (n) = 3  
 Capacity of Knapsack (M) = 20  
 Profits[ P1, P2, P3]=[25,24,15]  
 Weights[w1,w2,w3]=[18,15,10]  
 Find the optimal solution. (10)
- Q.6** a. Write an algorithm to construct a heap from the elements of a given array by using the bottom up approach. What is its time complexity? (9)
- b. What is an AVL tree? Explain the need for rotation of AVL trees. Construct an AVL tree for the list 8, 9, 11, 6, 5, 7, 10 by using successive insertion. Illustrate the steps clearly. (9)
- Q.7** a. Explain the concept of 2-3 tree. How can keys be inserted into it. Comment on the the efficiency of search operations on a 2-3 tree. (6)
- b. What is Spanning Tree and Minimum Spanning Tree (MST)? Write Kruskal's algorithm to find MST and apply the algorithm on the following graph: (12)

