Exam Slot → **B**

APJ Abdul Kalam Technological University
First Semester M.Tech Degree Examination January 2016
Ernakulam II Cluster
COMPUTER SCIENCE AND ENGINEERING
Specialization: COMPUTER SCIENCE AND ENGINEERING

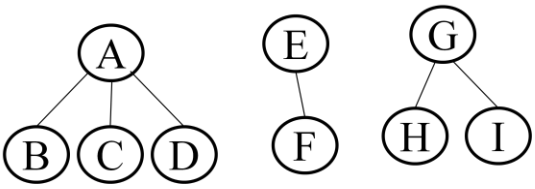
05CS 6003-ADVANCED DATA STRUCTURES AND ALGORITHMS

Time: 3 hrs. Max. Marks: 60

I.

a) Write an algorithm to insert elements to a red black tree. (4 Marks)

b) Transfer the following forest into a binary tree



(4 Marks)

c) Build a patricia for the following data
0001, 1011, 0101, 1001, 0011, 0100, 0111 (4 Marks)

II

a) Differentiate single ended priority queue and double ended priority queue (2 Marks)

b) What is the time complexity of searching minimum element in a max heap? Justify your answer. (3 Marks)

c) Given an example of Height Biased Leftist Tree that is not Weight Biased Leftist Tree as well as Weight Biased Leftist Tree that is not Height Biased Leftist Tree (3 Marks)

d) Into an empty 2-pass min pairing heap, insert elements with priority 20, 10, 5, 18, 6, 12, 14, 9, 8 and 22. Draw the final min pairing heap. Delete the minimum element from the above paring heap and draw the resultant pairing heap. (4 Marks)

III

a) For the function $f(n) = 2^n + 6n^2 + 3n$, find O-notation and Ω-notation (4 Marks)

b) Draw the recursion tree for the running time of a particular algorithm specified as: $T(n) = T(n/3) + T(2n/3) + n$. Also find shortest and longest path length of that tree (7 Marks)

c) Find an optimal parenthesization of matrix-chain product whose dimensions are 4X10, 10X3, 3X12, 12X20 and 20X7 (7 Marks)

OR

IV

a) Find Θ-notation for the function $f(n) = 27n^2 + 16n$ (4 Marks)

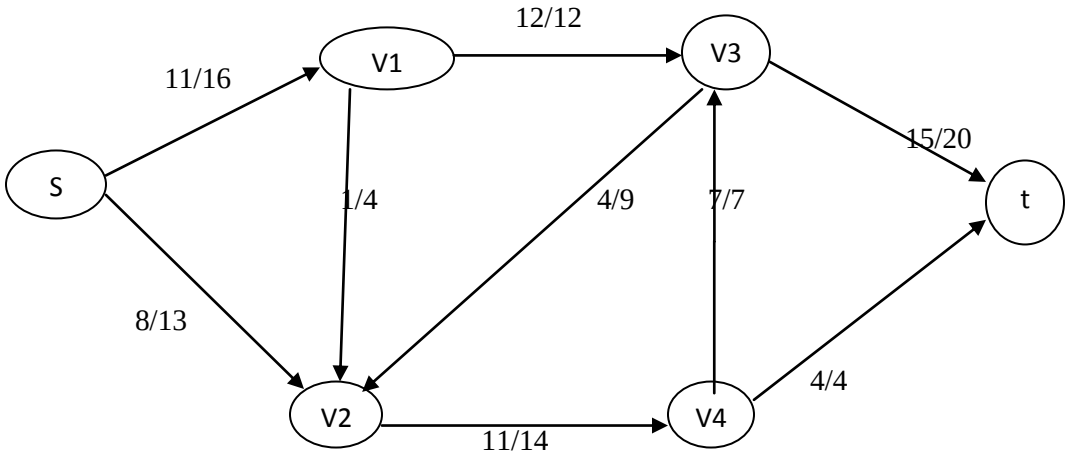
b) Solve the recurrence relation by iteration method
$T(n) = 8T(n/2) + n^2$ (7 Marks)

c) Write an algorithm for Longest Common Subsequence (LCS) Problem. Determine the LCS of X=<1,0,0,1,0,1,0,1> and Y = <0,1,0,1,1,0,1,1,0> (7 Marks)

V

a) Show how to implement the incremental method for computing the convex hull of n points so that it runs in O (n logn) time. (6 Marks)

b) Given a flow network G and the corresponding flow f is shown in the figure below.



i) Design a residual network induced by the flow
ii) Find out the Augmenting path
iii) Find out the minimum cut corresponding to the maximum flow network. (12 Marks)

OR

VI

a) Show how to find out the closest pair of points in O(n logn) time by using divide and conquer approach. (6 Marks)

b) Analyse the complexities of Ford-Fulkerson and Edmond Carp Algorithm (5 Marks)

c) Show how to use the Ford-Fulkerson method to find a maximum matching in an undirected bipartite graph G = (V, E) in time polynomial in |V| and |E|. (7 Marks)