

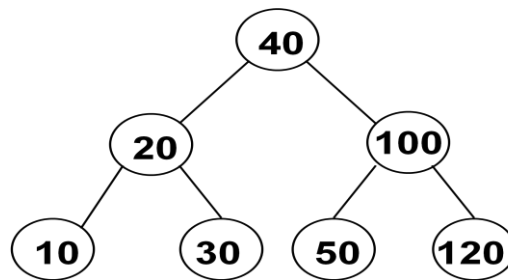
APJ Abdul Kalam Technological University  
First Semester M.Tech Degree Examination December 2016  
Ernakulam II Cluster  
COMPUTER SCIENCE AND ENGINEERING  
Specialization: COMPUTER SCIENCE AND ENGINEERING

**05CS 6003-ADVANCED DATA STRUCTURES AND ALGORITHMS**

Time: 3 Hours

Max Marks: 60

- I a) Write an algorithm to insert an element into a Red-Black Tree. Analyse the complexity of this operation. (5 marks)
- b) Insert a node with key value 60 in to the following bottom-up splay tree. Draw the resultant splay tree after the splay operations (3 marks)



- c) Draw the Suffix Tree for  $S = ababab$  (4 marks)
- II a) Write and analyze algorithm for melding of two weight biased max-leftist tree. (5 marks)
- b) Which is efficient between Fibonacci heaps and pairing heaps? Justify. (3 marks)
- c) Insert following elements in to a min pairing heap - 10, 20, 5, 26, 6, 1, 28, 4 (4 marks)
- III a) Solve  $T(n) = 27 T(n/3) + n^2$  using Master theorem (3 marks)
- b) Consider the following recurrence  $T(n) = 4 T(n/2) + n^2$ . Obtain the asymptotic bound using recursion tree method and verify using substitution method. (9 marks)
- c) Find the O-notation for the following functions: (6 marks)

i)  $f(n) = 5n^3 + n^2 + 6n$

ii)  $f(n) = 3n^2 + 7$

**OR**

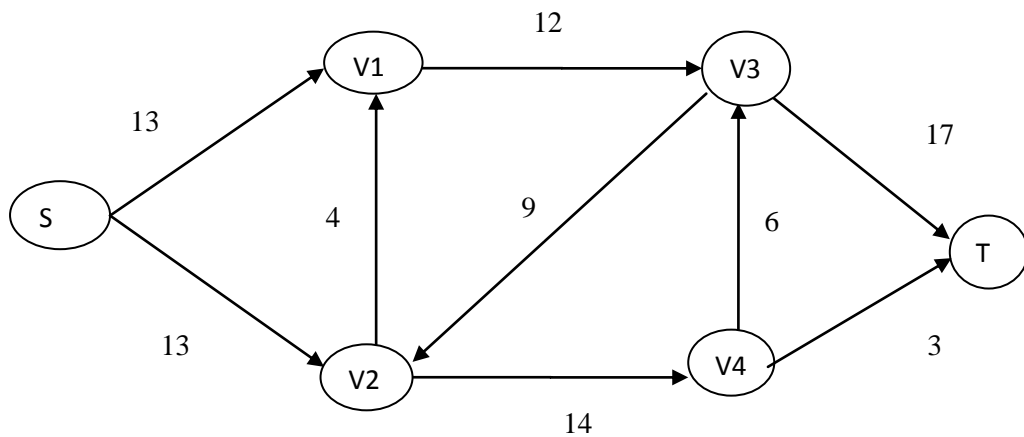
IV a) How dynamic method becomes different from divide and conquers method? (3 marks)

b) Explain algorithm for memoized matrix-chain multiplication. Also analyze its time complexity. (8 marks)

c) Given two sequences  $X = \langle A, C, C, G, G, T, A, G \rangle$  and  $Y = \langle G, T, C, G, T, T, A \rangle$ . Find longest common subsequence of X and Y using dynamic method. (7 marks)

V a) Prove that total number of flow augmentations according to Edmonds-Karp algorithm is  $O(VE)$ . (6 marks)

b) Given a flow network G and find the corresponding maximum flow f from S to T using Ford-Fulkerson method. Also show resultant flow graph after each flow augmentations. (12 marks)



**OR**

VI a) Illustrate and analyze Jarvis's march for computing the convex hull of n points. (6 marks)

b) Discuss and analyze an algorithm for finding the closest pair of points in  $O(n \log n)$  time by using divide and conquer approach. (12 marks)