

**COLLEGE OF ENGINEERING, PUNE**  
(An Autonomous Institute of Govt. of Maharashtra)

**ESE Nov/Dec 2012**

**(CT 402) Design and Analysis of Algorithms**

**Class: - B. Tech. (Computer Engineering)**

**Year: - 2012-13**

**Semester: - VII**

**Duration: - 3hrs**

**Max. Marks: - 50**

**Instructions:**

1. All the Questions are compulsory.
2. Assume suitable data whenever necessary.
3. Draw neat figures wherever required
4. Figures to right indicate full marks
5. Use of calculator is allowed

Q.1 A) Show that for any real constants a and b, where b>0, [02]  
 $(n + a)^b = \Theta(n^b)$

B) Define Asymptotic notation ( $\Theta$ -notation, O-notation,  $\Omega$ -notations) [03]

Q.2. A) Solve the following recurrence using recurrence tree method. [04]

$$T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\lg n}$$

B) Suppose that a node x is inserted into a red-black tree with RB-INSERT and then immediately deleted with RB-DELETE. Is the resulting red-black tree the same as initial red-black tree? Justify your answer with suitable examples. [04]

Q.3. A) Write merge sort algorithm and analyze it. [04]

B) What is an optimal Huffman code for following set of frequencies based on the first 8 Fibonacci numbers? [04]  
 a:1 b:1 c:2 d:3 e:5 f:8 g:13 h:21  
 Generalize your answer to find optimal code when frequencies are first n Fibonacci numbers.

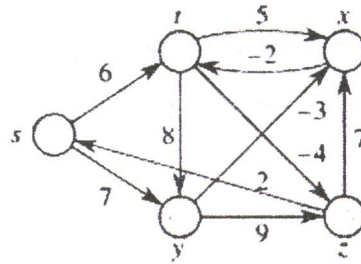
Q.4. A) Find the optimum parenthesization for multiplication of the matrix chain given below. Compute 'm' and 's' tables for storing cost and indexes achieved. [04]

Matrix	A1	A2	A3	A4	A5	A6
Dimension	30X35	35X15	15X5	5X10	10X20	20X25

B) What is 0/1 and fractional knapsacks problem? Explain: [04]  
 fractional knapsack problem has greedy-choice property.

Q.5. A) Determine the LCS of (1,0,0,1,0,1,0,1) and (0,1,0,1,1,0,1,1,0) [04]  
using dynamic programming.

B) Use Bellman-ford Algorithm to find the shortest path in the following graph from source s to z. Explain each step. [04]



Q.6. A) Write and explain Floyd-Warshall algorithm for finding all pair shortest path. [04]

B) What is vertex cover problem? Write an algorithm and illustrate it with suitable example. [04]

Q.7. A) Write Notes: (Any two) [05]

- i. NP-Completeness
- ii. Hamiltonian circuits
- iii. Indicator Random Variable