Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 710201N **Date: 23-12-2013**

Subject Name: Computer Algorithms

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the terms: (Give example wherever necessary) i) Articulation Point ii) Decrease Key iii) Order statistics iv) NP complete problem **08**

(b) Differentiate greedy, divide and conquer and dynamic programming algorithm design strategies. **03**

(c) Define binomial tree and explain its properties. **03**

Q.2 **(a)** i) Explain the terms weighted union, union by rank and path compression heuristics **04**

ii) Show that any comparison based sorting algorithms requires Ω(nlgn) comparisons in worst case. **03**

(b) Give properties of red black trees and explain its rotations with example **07**

OR

(b) Explain how red black tree can be augmented to retrieve an element with a given rank. **07**

Q.3 **(a)** Explain following operations on Fibonacci heap **07**

i) Insertion of a node ii) Union of two Fibonacci heaps

(b) Write down counting sort algorithm and determine its time complexity. **07**

OR

Q.3 **(a)** What is binomial heap? Explain union operation on two binomial heaps. **07**

(b) Write down bucket sort algorithm. Derive its time complexity. **07**

Q.4 **(a)** Consider the chain of matrices A1,A2,..,A6 with the dimensions given below. Give the optimal parenthesization to get the product A2..A5 **07**

Matrix	Dimension
A1	30 X 35
A2	35 X 15
A3	15 X 5
A4	5 X 10
A5	10 X 20
A6	20 X 25

(b) What is an amortized analysis? Explain aggregate method of amortized analysis using suitable example. **07**

OR

Q.4 **(a)** Discuss 0-1 knapsack problem. Consider an instance of a knapsack problem with seven items and weight carrying capacity as W=12. Weight and values of items are given below. Solve this problem using dynamic programming **07**

Item	1	2	3	4	5	6	7
Value	1	3	5	12	13	15	18

(b) Define B-tree. Explain with example how B-tree is constructed **07**

Q.5 **(a)** Analyze the running time of DFS algorithm if graph is represented by adjancy matrix instead of adjancy list. **04**

(b) Define precisely Set Cover and Vertex Cover problems. . **04**

(c) What is polynomially turing reducible problem? Explain with example how problem A can be polynomially Turing reduced to problem B. **06**

OR

Q.5 **(a)** Describe bitonic sorting with example. **07**

(b) Write a short note on approximation algorithms **04**

(c) Define P, NP, NP completes problems. **03**

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