M Tech morning

D: 03/01/2014

Exam No: ________

GANPAT UNIVERSITY

M. Tech. Semester – I Information Technology

Regular Examination, Jan - 2014

3IT103: Computer Algorithms

Max Time:-3 Hours] **]Max Marks: 70**

Instructions:

1. Figures to the right indicate full marks.
2. Each section should be written in a separate answer book.
3. Be precise and to the point in your answer.

Section – I

Q – 1 **(A)** Find the optimal assignment for following data using Branch and Bound technique. Here A,B,C,D are persons and 1,2,3,4 are various tasks. Table values indicate the cost of assigning particular task to some person. **[6]**

	1	2	3	4
A	15	10	9	6
B	8	13	4	12
C	13	20	7	11
D	6	19	16	4

(B) Write any algorithm which has $O(n^2)$ time complexity and verify it using tabular method. **[6]**

OR

Q – 1 **(A)** Design a power calculation algorithm which has time complexity $O(\lg n)$. **[6]**

(B) Prove Followings. **[6]**

1. $\log(\sqrt{n}) = O(\log n)$.
2. $4^{n+1} = O(4^n)$ but $4^{2n} \neq O(4^n)$

Q – 2 **Find big-oh notation for following recurrences.**

(A) $T_n = 1$, if n=0 **[5]**

$= 3T_{n-1} + n + 2^{2n}$, n>0

(B) $T(n) = 3T(n/4) + \Theta(n^2)$ use recurrence tree method. **[6]**

OR

Q – 2 **Find big-oh notation for following recurrences.**

(A) $T(n) = 2T(n-1) + 2$ **[5]**

(B) **1.** $T(n) = 2T(n/4) + n^{0.51}$ **2.** $T(n) = T(2n/3) + n^2$ **[6]**

Q – 3 **(A)** State true or false for followings. **[6]**

1. $n^2 = O(n^2)$
2. $\lg n = \Omega(n)$
3. $n^3 = \varnothing(n^4)$
4. $3^{n+9} = O(4^n)$
5. $\varnothing(1) = O(1)$
6. $n^2 + 10 = \Omega(1)$

(B) Write binary search algorithm and analyze it for best case and worst case using tabular method. **[6]**

Section – II

Q – 4 **(A)** Show the working of graph searching technique on suitable graph which uses queue data structure. Give its time complexity. **[6]**

(B) What is backtracking? Solve 4-queen problem using backtracking. **[6]**

OR

Q – 4 **(A)** Given a set S = <2, 5, 6, 7, 8> and (target sum) Z=13. Obtain the subset sum using backtracking approach. Also draw the tree that shows the backtracking. **[4]**

(B) Find the LCS of (A B D C F E G) and (B D A C B E G) using dynamic programming. Show complete table use to find LCS and also write equations used to fill up the table. **[8]**

Q– 5 **(A)** Prove that VERTEX-COVER $\leq_P$ INDEPENDENT-SET. **[5]**

(B) Consider following instance of the **fractional** knapsack problem, with v depicting the value and w depicting the weight of each item whereas W depicting the total weight carrying capacity of the knapsack. **[6]**

i = [1 2 3 4] v = [50 30 25 60] w = [40 15 30 20] W = 90

Solve this problem using **greedy strategy**. Also write algorithm.

OR

Q – 5 **(A)** What is decision and optimization version of problem? Give both the version for problem of Hamiltonian cycle and clique of graph. **[5]**

(B) Consider following instance of the **binary** knapsack problem, with v depicting the value and w depicting the weight of each item whereas W depicting the total weight carrying capacity of the knapsack. **[6]**

i = [1 2 3 4] v = [30 10 55 60] w = [10 13 5 8] W = 20

Solve this problem using **dynamic programming**.

Q – 6 **(A)** Write worst case recurrence relation of merge sort. Show the working of merge sort algorithm on following data. **[4]**

10, 25, 36, 9, 2, 15, 99, 87, 65, 14

(B) What is chain matrix multiplication problem? Find the optimal way of multiplying following matrices using dynamic programming. **[8]**

A: 5 x 50, **B:** 50 x 10, **C:** 10 x 60, **D:** 60 x 3

END OF PAPER