Exam No: _____

GANPAT UNIVERSITY

M. Tech. Semester – I Computer Engineering

Regular Examination, Jan - 2014

3CE103: 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)** Show that for any real constants a and b, b > 0, $(n+a)^b = \Omega(n^b)$. [4]

(B) Construct the prefix free code using greedy algorithm for following frequency table. [4]

A:20, B:17, C:2, D:1, E:6, F:15, G:20, H: 86, I:25, J:45

(C) Find the theta notation for $p(n) = 2n^5 - n^3 + 6n^{3.5}$ [4]

OR

Q – 1 **(A)** For following algorithm find the upper bound using tabular method. [6]

```
Algorithm Recursion(n)
{ if (n<=1) return n;
  else
    2*Recursion(n-1); }
```

(B) Find Big oh (O) notation for the following functions. Clearly indicate value of constant C and n_0. [6]

1. $n^3 + 5n + n^{1.5}$ 2. $6^n + 2n * \lg n$

Q – 2 Find the upper bound of following recurrences.

(A) 1. $T(n) = T(n/3) + T(2n/3) + \Theta(n)$ 2. $T(n) = n^2 + T(n-1)$ [8]

(B) $T(n) = 4T(n/2) + n^2$ [3]

OR

Q – 2 Find the upper bound of following recurrences.

(A) $T(n) = 3T(n-1) + (n+4)\,2^n$ [6]

(B) $f(n) = n^2 + f(n-1)$ [5]

Q – 3 **(A)** Construct AVL tree using following data. [4]

10, 2, 25, 28, 6, 89, 47, 26, 34, 18

(B) State true or false for followings. [4]

1. $n^{2.5} = O(n^2)$
2. $n * \lg n = O(n)$
3. $2^{n+9} = O(4^n)$
4. $1 + n = \Omega(1)$

(C) Let $t_A(n)$ and $t_B(n)$ denote the running times of two programs A and B respectively. For following pairs find the value of n for which program A is faster than program B. [4]

1. $t_A(n) = 10n$, $t_B(n) = 5n^2$ 2. $t_A(n) = 81n^2$, $t_B(n) = 3n^3$

Section – II

Q – 4 (A) Write an algorithm to find solution of coin change problem using dynamic programming. [6]

(B) What is backtracking? Given a set S = <4, 6, 9, 11, 13> and (target sum) X=20. Obtain the subset sum using backtracking approach. Also draw the tree that shows the backtracking. [6]

OR

Q – 4 (A) Write prim's algorithm to construct minimum spanning tree from given graph and analyze its time complexity. [6]

(B) Write decision and optimization version of knapsack and bin packing problem. [4]

(C) Construct AVL tree using following elements. [2]
10,25,7,9,26,89,11,28,23

Q– 5 (A) Write greedy algorithm for binary knapsack problem. Give its time complexity. [5]

(B) What is NP-hard and NP-Complete problem? Show that Hamiltonian cycle is NP problem. [6]

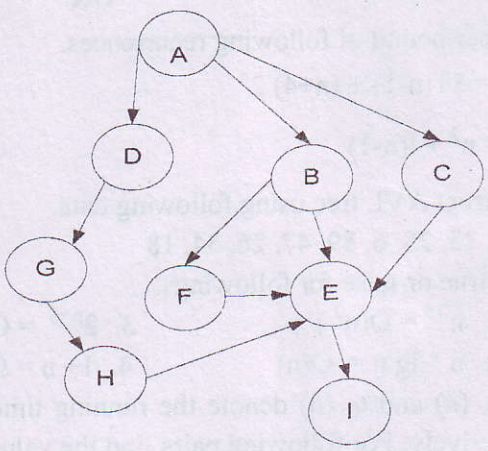
OR

Q – 5 (A) Write greedy algorithm for activity selection problem. Give it's time complexity. For following intervals select the activities according to your algorithm. [5]
I_1 (1-3), I_2 (0-2), I_3 (3-6), I_4 (2-5), I_5 (5-8), I_6 (3-10), I_7 (7-9).

(B) Prove that VERTEX-COVER $\leq_P$ SET-COVER. [6]

Q – 6 (A) Find the LCS of (A B D C E F G) and (B A D F E C G) using dynamic programming. Draw the table that is used to find LCS. Also write various conditions used to fill up the table. [6]

(B) Apply graph searching techniques which uses queue data structure for following graph and draw the corresponding tree. Also write sequence in which nodes get searched and time complexity of technique used. [6]



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