Exam No: _____

GANPAT UNIVERSITY

M. TECH SEM. I COMPUTER ENGINEERING/INFORMATION TECHNOLOGY

REGULAR EXAMINATION NOV-DEC 2016

3CE102/3IT102: COMPUTER ALGORITHMS

Max. Time: 3 hours **Max. Marks: 60**

Instructions: 1. This Question paper has two sections. Attempt each section in separate answer book.
2. Figure to the right indicates full marks.
3. Be precise and to the point in answering the descriptive questions.

SECTION – I

Q – 1 (a) For following algorithm find the upper bound using tabular method. **(5)**

```
Algorithm Test (n)
{ if (n<=1) return n;
  else
     while(n>0){
          print('hello'); n=n/2;}}
```

(b) Find Omega (Ω) notation for the following functions. Clearly indicate value of constant C and n_0. **(5)**

1. $3*2^n + 2n^2$ 2. $5n^2 + n * \lg n - 2$

OR

Q – 1 (a) Let t_A (n) and t_B (n) denote the running times of two programs A and B respectively. For following pairs find which program runs faster and for what value of n. **(5)**

1. $t_A(n) = 500n$, $t_B(n) = n^2$ 2. $t_A(n) = n^2 + 100n$, $t_B(n) = n^3$

(b) Find Big-oh (O) notation for the following functions. Clearly indicate value of constant C and n_0. **(5)**

1. $2n^2 + 10n + n^{3.5}$ 2. $5*n! + n^2$

Q – 2 Solve following recurrence relations and express your answer using big-oh (O) notation.

(a) $T(n) = \begin{cases} 2 & , \text{if } n = 0 \\ 2\,T(n-1) - (n+2)3^n & , \text{otherwise} \end{cases}$ **(5)**

(b) 1. $T(n) = 4T(n/2) + n^2$ 2. $T(n) = T(n/2) + n^2$ **(5)**

OR

Q – 2 Solve following recurrence relations and express your answer using big-oh (O) notation.

(a) $T(0)=0$, $T(1)=4$, $T(n) = 5T(n-1) - 6\,T(n-2)$ if $n>1$ **(5)**

(b) $T(n) = T(2n/5) + T(3n/5) + n$ **(5)**

Q – 3 (a) Consider the data 10, 5, 60, 9, 45, 8, 67, 2 given to unknown sorting algorithm and that sorting algorithm has produced data 5, 10, 9, 45, 8, 60, 2, 67 after its first pass. Identify this sorting algorithm and also write that algorithm. **(5)**

(b) Draw the tree for following data that indicates number of comparisons required to search each element using binary search algorithm. **(5)**
11, 20, 35, 42, 49, 50, 81, 92, 113, 140

SECTION – II

Q – 4 (a) What is the time complexity of calculating inversions in list using brute force method? Count the inversions from following list using divide and conquer design technique. Also mention the complexity of divide and conquer method. **(5)**

50, 53, 12, 1, 90, 4, 17, 11, 10, 15

(b) Solve the given **(0/1)** knapsack problem using greedy approach. Consider the knapsack instance with n =3, weights (w1, w2, w3) = (20 10 30) and values (p1, p2, p3) = (20 15 50), Capacity M=40. Find the optimal solution. **(5)**

OR

Q – 4 (a) For graph given in below fig A. show its adjacency list and matrix representations. If one has to know the edge between two nodes then which graph representation technique is efficient? **(5)**

(b) Design an instance of knapsack problem for 5 objects (i.e. weight and value of each object and capacity of knapsack) so that it gives optimal answer for maximum value criterion but not for minimum weight criterion. **(5)**

Q – 5 (a) What is clique in graph? Show that clique of graph problem is in NP. **(5)**

(b) Find the longest common subsequence (LCS) of (A C B D C F E G) and (B D A C B F E G) using dynamic programming. Show complete table used to find LCS and also write equations used to fill up the table. **(5)**

OR

Q – 5 (a) Write greedy algorithm for activity selection problem. For following intervals select the activities according to greedy algorithm to find optimal answer. I1 (0-7), I2 (1-2), I3 (2-5), I4 (5-7), I5 (8-9), I6 (7-10), I7 (1-7) **(5)**

(b) What is graph coloring problem? Show that graph coloring problem is NP problem. **(5)**

Q – 6 (a) Find the optimal way of multiplying following matrices using dynamic programming. **(6)**

A:4 x 5, **B:** 5 x 15, **C:**15 x 80, **D:** 80 x 50

(b) Draw the BFS (Breath First Search) and DFS (Depth First Search) tree correspond to graph given in following figure A. **(4)**

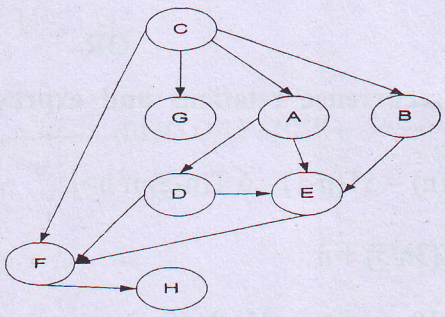

Fig A.

----- END OF PAPER -----