COMP 6 – 1 (RC)

T.E. (Computer) (Semester – VI) (RC) (2007-08) Examination, May/June 2018
MODERN ALGORITHM DESIGN FOUNDATION

Duration : 3 Hours | Total Marks : 100

Instruction : *Attempt **five** questions, with **one** question from **each** Module.*

MODULE – I

1. a) What do you understand by recursion ? With the help of an algorithm explain any example which proves recursion as a powerful programming technique. **8**

   b) Define time complexity of an algorithm. Calculate time complexity of the following algorithm using table building method.

   ```
   Algorithm sum (a [ ], n, m)
   {
       for i = 1 to n do;
       for j = 1 to m do;
       S = S + a [i] [j];
       return S;
   }
   ```

   5

   c) Explain how Binary Search fits in Divide and Conquer Strategy. Calculate its time complexity for best, average and worst case scenario. **7**

2. a) Define the following : **3**
      a) O (Big Oh)
      b) Ω (Omega)
      c) θ (Theta).

   b) With the help of an algorithm explain how time complexity of QuickSort can be improved using a randomizer. **8**

   c) Show Strassen's Matrix multiplication process on Matrix A and B given below.

   $$A = \begin{bmatrix} 1 & 4 \\ 6 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 2 \\ 4 & 1 \end{bmatrix}.$$

   5

   d) Explain Randomized algorithm. **4**

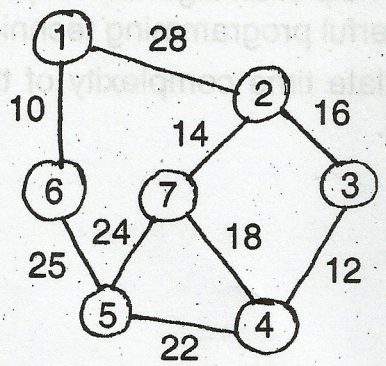
MODULE – II

3. a) Write Kruskal's algorithm to find minimum cost spanning tree for a graph. 6

   b) Construct optimal binary search tree for the set (a_1, a_2, a_3, a_4) = (do, if, int, while) p(1, 2, 3, 4) = (3, 3, 1, 1) and q(0, 1, 2, 3, 4) = (2, 3, 1, 1, 1). 8

   c) Find the optimal solution for job sequencing with deadlines using the following data (P_1, P_2, P_3, P_4) = (70, 12, 18, 35) and (D_1, D_2, D_3, D_4) = (2,1, 2, 1). 6

4. a) Find minimum cost spanning tree for the following graph using Prims algorithm. 6



   b) Write an algorithm for forward approach of an multistage graph. 6

   c) Find an optimal solution for O/I knapsack problem for knapsack instance n = 3(p_1, p_2, p_3) = (1, 2, 5) (w_1, w_2, w_3) = (2, 3, 4) and M = 6. 8

MODULE – III

5. a) Explain the concept of backtracking with the help of N Queens problem. 8

   b) Write an algorithm for generating Hamiltonian cycle in a graph. 6

   c) Explain FIFO branch and bound technique with the help of an example. 6

6. a) Draw the solution space tree for n = 4, w[1, 2, 3, 4] = [3, 4, 5, 6] and M = 6 using sum of subset algorithm. 8

   b) Write and explain an algorithm to estimate the total number of nodes in a state space tree. 6

   c) Write an algorithm for recursively backtracking in a tree in general. 6

MODULE – IV

7. a) Implement Brute Force algorithm to check whether the pattern P = engineer lies in the text T = "Computer Engineering" or not. 6

   b) Draw the suffix trie and the compact representation of the suffix trie for the string "minimize". 6

   c) Draw the frequency table and Huffman tree for the following string X.
   X = "a fast runner need never be afraid of the dark". Also obtain the code for each character in X. 8

8. a) Write an algorithm and explain synchronous leader election in a ring network of processors. 8

   b) Explain the following with respect to Distributed Unicast Routing.
      i) Link State Algorithm.
      ii) Distance Vector Algorithm. 10

   c) What are tries ? List the different types of tries with the help of an example. 2
