COMP 6 – 1 (RC)

T.E. (Computer) (Semester – VI) (RC) Examination, May/June 2015
(Revised Course)
MODERN ALGORITHM DESIGN FOUNDATION

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Answer **any five full** questions, atleast **one** from **each** Module.*
*2) Make suitable assumptions **wherever** necessary.*

MODULE – I

1. a) Define Big "oh" notation, omega notation and theta notation. **3**
   b) Explain how to calculate the running time of an algorithm. **6**
   c) Given the set of numbers S = {22, 13, – 5, – 8, 15, 60, 17, 31, 47} draw the tree of recursive calls of MaxMin. **5**
   d) Explain Strassen's matrix multiplication. **6**

2. a) Explain the following :
      i) Randomized algorithm
      ii) Recursive algorithm. **6**
   b) Explain the two phases of testing a program. **3**
   c) Given the set of numbers S = {310, 285, 179, 652, 351, 423, 861, 254, 450, 520} draw the tree of calls of MergeSort (1, 10) and tree of calls of Merge. **6**
   d) Explain radix sort. **5**

MODULE – II

3. a) Give the greedy method control abstraction for the subset paradigm. **4**
   b) Write Prim's algorithm to find the minimum-cost spanning tree and state its complexity. **7**
   c) Given a directed weighted graph G = (V, E, W) where V = {s, t, y, x, z}, E = {<s, t>, <s, y>, <t, y>, <y, t>, <t, x>, <y, x>,<x, z>, <z, x>, <y, z>, <y, s>}, W = {3, 5, 2, 1, 6, 4, 2, 7, 6, 3}. Find the shortest path from "s" to all the other vertices using greedy method. **6**
   d) Define and explain the principle of optimality. **3**

P.T.O.

4. a) State the knapsack problem and provide the algorithm for greedy strategies for the knapsack problem. 6

   b) Consider an undirected weighted graph G = (V, E, W) where V = {1, 2, 3, 4, 5, 6}, E = {<1, 2>, <1, 6>, <2, 7>, <2, 3>, <3, 4>, <4, 5>, <5, 6>, <5, 7>, <7, 4>}, W = {28, 10, 14, 16, 12, 22, 25, 24, 18}. Use Kruskal's algorithm to construct a minimum cost spanning tree. 6

   c) Consider the following directed weighted graph G = (V, E, W) where V = {1, 2, 3, 4, 5}, E = {<1, 2>, <1, 3>, <2, 3>, <2, 4>, <2, 5>, <3, 4>, <3, 5>, <4, 2>, <5, 1>, <5, 4>}, W = {6, 7, 8, 5, – 4, – 3, 9, – 2, 2, 7}. Find the shortest path from the source vertex 1 to all the other vertices using the Bellman and Ford algorithm. 5

   d) Differentiate between the greedy method and dynamic programming. 3

MODULE – III

5. a) What is the 8-queen's problem ? Explain. 5

   b) Write the backtracking algorithm for the subset sum problem. 5

   c) Draw the solution space tree to find Hamiltonian cycle(s) for the undirected graph G = (V, E) where V = {1, 2, 3, 4, 5, 6, 7, 8}, E = {<1, 2>, <1, 5>, <1, 4>, <1, 7>, <2, 3>, <3, 5>, <3, 7>, <3, 8>, <4, 6>, <5, 6>, <6, 7>, <7, 8>}. 6

   d) What is FIFO search and LIFO search in branch-and-bound terminology ? 4

6. a) What is graph colouring ? Explain with the help of an example. 5

   b) Define explicit constraints and implicit constraints. What are the implicit constraints and explicit constraints for the n-queens problem and the sum of subsets problem. 6

   c) With respect to the sum of subsets problem explain what is the variable tuple size formulation and the fixed tuple size formulation. 5

   d) Write the function u (•) for the knapsack problem. 4

MODULE – IV

7. a) Write the Boyer-Moore pattern matching algorithm. **5**

   b) What is a suffix trie ? **3**

   c) Define inverted file and occurrence list with respect to search engines. **2**

   d) Explain leader election in a ring under the synchronous model. **5**

   e) Explain the flooding algorithm for broadcast routing. **5**

8. a) What is a compressed trie ? **5**

   b) Write an algorithm for Huffman coding. **5**

   c) What are the complexity measures for network algorithms ? **4**

   d) Write a short note on the reverse path forwarding algorithm. **6**
