# COMP 6 – 1 (RC)

## T.E. (Comp.) (Semester – VI) (RC) Examination, May/June 2017
## MODERN ALGORITHM DESIGN FOUNDATION

Duration : 3 Hours | Total Marks : 100

***instruction :*** *Answer **any five** questions by selecting atleast **one** question from **each** Module.*

MODULE – I

1. a) Prove that
   i) $3n^2 + 4n - 2 = 0(n^2)$
   ii) $27n^2 + 16n + 25 = \Omega(n^2)$
   iii) $n^2/2 - 3n = \theta(n^2)$. **6**

   b) Explain the following :
   i) Randomized Algorithm
   ii) Recursive algorithm. **6**

   c) Explain randomized quick sort algorithm. Apply the algorithm to sort the following data set.
   S = {35, 40, 23, 16, 18, 39, 28, 17}. **8**

2. a) Find the product of the following two matrices using Strassen's matrix multiplication method. Show all the steps.

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 2 & 7 & 1 \\ 2 & 7 & 0 & 5 \\ 4 & 3 & 2 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 5 & 6 & 7 & 8 \\ 1 & 0 & 3 & 4 \\ 6 & 2 & 7 & 0 \\ 8 & 1 & 6 & 5 \end{bmatrix}.$$ **10**

   b) Explain binary search using divide and conquer strategy. **6**

   c) Define :
   i) Space complexity ii) Time complexity **4**

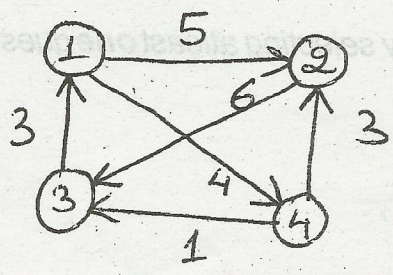
   Find space complexity for the following code int seqsearch (int * a, int n, int key)

```
{
    for (int i = 0; i < n; i + +)
        if (a[i] = = key)
} return i; return – 1;
```

## MODULE – II

3. a) Write Dijkstra's algorithm to generate shortest paths and state its complexity. 6

   b) Find all pair shortest paths for the following graph. 6



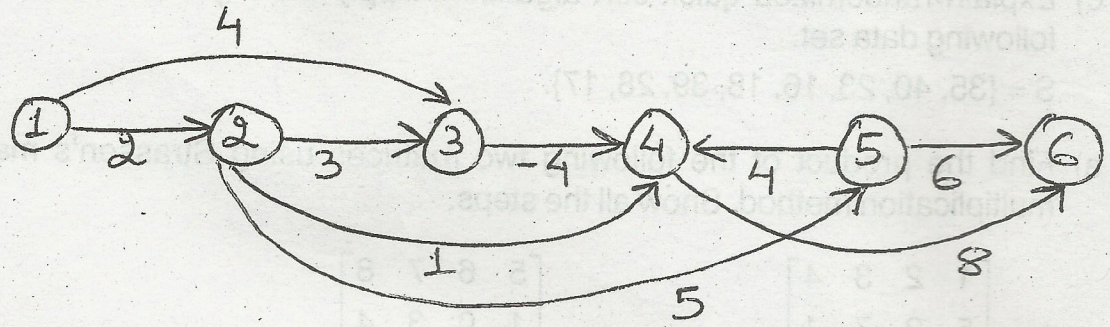

   c) Define the following w.r.t. flow shop scheduling. 8

   i) MFT ii) OFT

   iii) POFT iv) OMFT

4. a) Write primes minimum cost spanning tree algorithm. State its complexity. 6

   b) Using Bellman Ford algorithm find the shortest path from node 1 to every other node for the following graph. 8




   c) Explain the general concept of dynamic programming with the help of a suitable example. 6

## MODULE – III

5. a) Explain rearrangement in backtracking. How does it help in developing an efficient backtracking algorithm ? 5

   b) Obtain solution to the sum of subset problem given s = {1, 3, 4, 5} and M = 8. Draw the state space tree. 8

   c) Explain the concept of Hamiltonian cycle in a graph with the help of an example. Also write the algorithm for obtaining a Hamiltonian cycle. 7

6. a) Generate a state space for the following cost matrix using branch and bound method.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | ∞ | 12 | 7 | 4 |
| 2 | 10 | ∞ | 13 | 9 |
| 3 | 3 | 8 | ∞ | 11 |
| 4 | 5 | 6 | 10 | ∞ |

10

b) Explain FIFO Branch and Bound Algorithm search in the state space tree for 4-Queens problem. 6

c) Draw state space tree for graph colouring problem when number of nodes in graph and number of colours used for colouring the graph is 3(three) : 4

MODULE – IV

7. a) Implement Boyer-Moore algorithm on the following data :

Text = aaccaaabcaabacc

Pattern = aabcaab 8

b) Illustrate the difference between a compressed trie and a standard trie using a suitable example. 6

c) Explain the following : 6

i) Flooding algorithm with Hop Count

ii) Flooding algorithm with sequence number.

8. a) Write the algorithm for Longest common subsequence problem. 6

b) Find last occurrence function for the pattern P = aababcbca where $\sum = \{a, b, c, d\}$. 4

c) Write synchronous breadth first search algorithm. 5

d) Explain reverse path forward algorithm in multicast routing. 5