

COMP 6 – 1 (RC)

T.E. (Comp.) (Semester – VI) (RC) Examination, May/June 2016
MODERN ALGORITHM DESIGN FOUNDATION

Duration : 3 Hours

Total Marks : 100

- Instructions:** 1) Attempt **any five** questions by selecting atleast **one** from **each** Module.
2) Make suitable assumptions if **required**.

MODULE – I

1. a) State the meaning of space and time complexity. 2
- b) Write a short note on debugging. 3
- c) What are the criteria for designing an efficient algorithm ? Justify your answer with suitable examples. 7
- d) Draw the step table and give the step count for the algorithm : 8

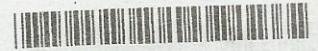
Algorithm Rsum (a, n)

```
{  
    if (n ≤ 0) then return 0.0;  
    else  
        return Rsum (a, n – 1) + a [n];  
}
```

2. a) Differentiate between the following asymptotic notations :
 - i) O (Big oh) and o (Little oh). 2
 - ii) Ω (omega) and ω (little omega). 2
- b) Write an algorithm for merge sort and prove that the worst case time complexity is $O(n \log n)$. 6
- c) Applying Strassen's method, show how you would multiply the following two matrices. 10

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 2 & 7 & 1 \\ 2 & 7 & 0 & 5 \\ 4 & 3 & 2 & 1 \end{bmatrix} \begin{bmatrix} 5 & 6 & 7 & 8 \\ 1 & 0 & 3 & 4 \\ 6 & 2 & 7 & 0 \\ 8 & 1 & 6 & 5 \end{bmatrix}$$

P.T.O.



MODULE – II

3. a) Explain what is a multistage graph. 6

b) Consider the directed graph $G = (V, E)$ where $V = \{1, 2, 3, 4\}$ and the edge length are given by a matrix below. Find the optimal tour of the graph.

0	12	5	7
11	0	13	6
4	9	0	18
10	3	2	0

c) Using Bellman and Ford algorithm find the shortest path from node 1 to every other node for the directed weighted graph $G = (V, E, W)$ where $V = \{1, 2, 3, 4, 5, 6\}$
 $E = \{<1, 2>, <1, 3>, <2, 4>, <2, 3>, <2, 5>, <3, 4>, <3, 5>, <4, 6>, <5, 6>, <5, 4>\}$
 and $W = \{2, 4, 1, 3, 5, -4, -2, 8, 6, 4\}$ 6

4. a) Define the principle of optimality. 2

b) Construct the optimal binary search tree for the identifier set

$(a_1, a_2, a_3, a_4) = (\text{cout}, \text{float}, \text{if}, \text{while})$ with $p(1 \dots 4) = (2, 2, 1, 1)$ and $q(0 \dots 4) = (2, 2, 3, 1, 1)$. 8

c) Draw a simple connected weighted graph with 8 vertices and 16 edges, each with unique edge weights. Identify one vertex as a start vertex and illustrate, assuming Dijkstra's algorithm on this graph. 10

MODULE – III

5. a) Generate a state space tree 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	∞

b) Using the backtracking technique devise an algorithm to solve the sum of subset problem. Given $S = [5, 10, 10, 25]$ and $M = 25$. Draw the search tree for fixed sized tuple as well as variable sized tuple formulation. 10



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| 6. a) Explain the principles of FIFO branch and bound. | 4 |
| b) Write the 8 Queen's algorithm. Demonstrate the algorithm for 8-queen's problem. Also draw the state space line. | 8 |
| c) Derive the algorithm for m-colouring problem considering backtracking technique. | 8 |

MODULE – IV

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|--|---|
| 7. a) Write a short note on Reverse Path Forwarding. | 5 |
| b) Write the Boyer Moore pattern matching algorithm. | 5 |
| c) Explain the following with respect to multicast algorithms. | |
| i) Center Based Trees. | 5 |
| ii) Steiner Tress. | 5 |
| 8. a) Write an algorithm for Huffman-Coding. | 5 |
| b) Write an example and explain what are suffix tries. | 7 |
| c) Using KMP algorithm find whether the pattern P = 0010 is in the text T = 1100011010001010 or not. | 8 |
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