Total No. of Questions : 8]　　　[Total No. of Printed Pages : 2

　　Roll No ....

MCA-404

M.C.A. IV Semester

Examination, June 2017

Design and Analysis of Algorithm

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
　　　ii) All questions carry equal marks.

1. a) Discuss stack data structure with its implementation methods and uses. 　7
   b) What do you mean by time complexity of an algorithm. What is meant by worst case, average case and best case of an algorithm. 　7

2. a) Discuss various asymptotic notations used in algorithm analysis. 　7
   b) What is binary search algorithm, write time complexity of it. Also write its limitations. 　7

3. a) Write diode and conquer algorithm. Discuss its complexity. 　7
   b) Describe graph traversal techniques. 　7

4. a) Write the Kruskal's algorithm for obtaining minimum spanning tree. Calculate its worst case time complexity. 　7
   b) What is 15 puzzle problem? How can we apply least-cost search on it? 　7

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5. a) If the cost adjacency matrix of the traveling salesperson problem is as follows:

$$\begin{bmatrix} \alpha & 20 & 30 & 10 & 11 \\ 15 & \alpha & 16 & 4 & 2 \\ 3 & 5 & \alpha & 2 & 4 \\ 19 & 6 & 18 & \alpha & 3 \\ 16 & 4 & 7 & 16 & \alpha \end{bmatrix}$$

   Obtain the state space tree generated by branch and bound technique. 　7
   b) What are the differences between dynamic programming and divide and conquer technique. 　7

6. a) Find optimal solution for O/I knapsack 　7
   Problem $(w_1, w_2, w_3, w_4) = (10, 15, 6, 9)$
   $(p_1, p_2, p_3, p_4) = (2, 5, 8, 1)$ and $M = 30$.
   b) Write a brief note on backtracking. 　7

7. a) What is an AVL Tree? Insert the following keys into an AVL Tree. 　7
   342, 206, 444, 523, 607, 301, 142, 183, 102, 157 and 149.
   b) What is 8-queens problem, write backtracking algorithm to solve this problem. 　7

8. a) Discuss the relationship between class P, NP, NP complete and NP hard problems with examples. 　7
   b) Show that Hamiltonian cycle problem is NP-complete. 　7

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