PG/IIS/COS-203/16

M.Sc. 2nd Semester Examination, 2016

DESIGN AND ANALYSIS OF ALGORITHM

PAPER – COS-203

Full Marks : 40

Time : 2 hours

Answer Q. No. 1 and any two questions

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. (*a*) Why analysis of algorithm is required ? Describe different design approches for developing algorithms.

   (*b*) Explain different types of asymptotic notations used in analysis of algorithms.

(*c*) Show the complexity of the recurrence relation shown below :

$$T(n) = \begin{cases} a & , \text{ if } n = 1 \\ 2T(n/2) + a_n, & \text{otherwise} \end{cases}$$

(1 + 2) + 4 + 3

2. (*a*) Explain divide and conquer strategy in detail. Write down the merge sort algorithm using divide and conquer strategy.

(*b*) Explain and derive the time complexity of quicksort. (4 + 6) + 5

3. (*a*) Explain the dynamic programming strategy. Describe the features an optimization problem should have for dynamic programming.

(*b*) What is matrix chain multiplication problem ? Write down the algorithm to solve matrix chain multiplication problem using dynamic programming strategy.

(2 + 3) + (2 + 8)

4. (*a*) Write an algorithm to solve *n*-Queens problem using backtracking technique. Find its time complexity.

   (*b*) Define branch-and-bound technique. Mention the steps to solve a problem using branch-and-bound. (7 + 3) + (2 + 3)

5. (*a*) What is greedy approach to solve a problem ? How it is different from dynamic programming ? Write an algorithm to solve fractional knapsack problem using greedy algorithm.

   (*b*) What is minimum spanning tree ? Write the Prim's algorithm to find the minimum spanning tree of a graph. (2 + 2 + 5) + (1 + 5)