2015

M.Sc.

2nd Semester Examination

DESIGN & ANALYSIS OF ALGORITHM

PAPER—COS-203

Full Marks : 40

Time : 2 Hours

The questions are of equal value.

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Answer Q. No. 1 and any *two* questions from the rest.

1. (a) What is an algorithm ? Why analysis of algorithm is required ?

   (b) What is asymptotic notation ? Define different types of asymptotic notation.

   (c) Show that the complexity of the below recurrence is $O(1)$:

   $$T(n) = \begin{cases} 3T(n-1), & \text{if } n > 0 \\ 1, & \text{otherwise} \end{cases}$$ $(1+1)+(1+4)+3$

2. (a) Explain divide and conquer strategy in detail. Write down algorithm for quick sort by applying divide and conquer strategy.

   (b) Explain and derive the time complexity of merge sort.
   $(4+6)+5$

(Turn Over)

3. (a) Using Backtracking techniques write an algorithm to solve n-Queens problem and find its time complexity.

(b) Mention all the steps of Dynamic programming. Define B-tree. (7+3)+(3+2)

4. (a) Write down the all necessary algorithms to implement a disjoint set forest with the union by rank heuristic.

(b) Write an algorithm to find an optimal parenthesization of a matrix chain product using dynamic programming approach, stating all steps of this approach.

5+10

5. (a) What is dynamic programming ? Explain the key features an optimization problem should have for dynamic programming.

(b) What is Knapsack problem ? Find the optimal solution of the following Knapsack problem using dynamic programming strategy : (2+3)+(2+8)

Total capacity C = 10

No. of objects i = 4

Item	1	2	3	4
Value	10	40	30	50
Weight	5	4	6	3

6. (a) What are the concept of reducibility and satisfiability ? Show that the clique problem is NP–complete.

(b) Define lower bound and upper bound ?

(c) What is light edge in a graph ? (3+7)+3+2