MCA 3rd Semester Examination, 2019

DESIGN AND ANALYSIS OF ALGORITHM

PAPER—MCA-303

Full Marks : 100

Time : 3 hours

Answer any **five** 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*) Define time and space complexity. 2

(*b*) Obtain the time complexity of Binary search algorithm. 6

(*c*) Discuss about different types of asymptotic notation used in algorithm. 6

2. (*a*) Write down the quicksort algorithm. Obtain its worst case time complexity. 6 + 2

   (*b*) What is the advantage of non-tail recursive function over tail recursive function ? 3

   (*c*) Write down the Mergesort algorithm using divide and conquer strategy. 3

3. (*a*) Explain about the dynamic programming approach used to solve an optimization problem. 6

   (*b*) Using dynamic programming strategy write down the all pair shortest path algorithm. 6

   (*c*) What is matrix chain multiplication problem ? 2

4. (*a*) Write down the DFS algorithm for graph traversal. 4

   (*b*) Write down the Fractional Knapsack problem using greedy approach. 6

   (*c*) Explain when disjoint set data structures are very useful. 4

5. (*a*) Explain P and NP class of problems with an example. 2 + 2

(*b*) Define NP complete and NP hard problems. 2 + 2

(*c*) Explain why circuit satisfiability problem and clique decision problem are NP complete problems. 6

6. (*a*) Write down the Prim's algorithm. 4

(*b*) Explain how eight queens problem is solved using backtracking. 4

(*c*) Write down the Kruskal's algorithm and find out its time complexity. 6

7. (*a*) What is branch and bound algorithm ? Explain how 15 puzzle problem is solved using branch and bound technique. 2 + 6

(*b*) Write an algorithm using backtracking for Graph coloring problem. 4

(*c*) What is Union-Find algorithm ? 2

8. Write short notes on the following : $3\frac{1}{2} \times 4$

(*i*) Approximation algorithm

(*ii*) DFT and FFT algorithm

(*iii*) Lower bound theory

(*iv*) Tower of Hanoi problem.

[*Internal Assessment* : 30 Marks]