

Total No. of Questions: 09

# MCA (2015 & Onward) (Sem.-5) DESIGN AND ANALYSIS OF ALGORITHMS

Subject Code: MCA-502 M.Code: 74382

Time: 3 Hrs. Max. Marks: 60

# **INSTRUCTIONS TO CANDIDATES:**

- 1. SECTIONS-A, B, C & D contains TWO questions each carrying TEN marks each and students has to attempt any ONE question from each SECTION.
- 2. SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.

### **SECTION-A**

- 1. (a) Differentiate between a Stack and a Queue. What are the operations allowed on stacks and queues?
  - (b) Write algorithms for AddQ and DeleteQ, assuming the queue is represented as a linked list.
- 2. What is a Binary Search Tree? Give algorithms for insertion, deletion and searching of a node in a binary search tree.

#### **SECTION-B**

- 3. What is meant by algorithm analysis? What is time-space trade-off? Define best-case, worst-case and average-case analysis of an algorithm? Which one is practically the best measure of the efficiency of an algorithm and why?
- 4. What do you mean by Asymptotic notation? Define  $\theta$  notation, O- notation and  $\Omega$  notation with examples.

#### **SECTION-C**

- 5. Differentiate between Greedy and dynamic programming algorithms. Solve the 0-1 knapsack problem by greedy strategy. Prove the correctness of the method as well.
- 6. Explain in detail about Quick sort. Illustrate the algorithm with a numeric example.

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# **SECTION-D**

- 7. Explain P, NP, NP-Complete and NP-Hard Problems with two examples for each class of problems.
- 8. What are the different techniques for graph traversal? Discuss and differentiate between them. Also explain the applications of each.

## **SECTION-E**

# 9. Answer briefly:

- a) What is an algorithm?
- b) What are the different orders of growth?
- c) Define Hashing.
- d) What is Selection sort? What is its complexity?
- e) Differentiate between linear search and binary search algorithms.
- f) What is an AVL tree?
- g) What is pruning in backtracking?
- h) Explain the Dijkstra's algorithm for shortest path in a graph.
- i) Explain Divide-and-conquer approach with an example.
- j) Show that Quick Sort algorithm takes O(n2) time in the worst case.

NOTE: Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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