Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

MCA (2015 & Onward) (Sem.–5)

DESIGN AND ANALYSIS OF ALGORITHMS

Subject Code : MCA-502

Paper ID : [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. What is a Stack data structure? How stacks are implemented? What are the operations that can be performed on stacks? Write pseudo-code for push and pop operations.

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 θ - notation, O- notation and Ω - notation with examples.

SECTION-C

5. Divide and conquer approach involves three steps at each level of recursion. What are all they? Show that Quick-sort algorithm closely follows these steps. Illustrate the operation of Quick sort on the array A = {3, 41, 52, 26, 38, 57, 9, 49}

6. Discuss the working of Radix Sort technique with an example. Also explain its complexity.

SECTION-D

7. Elaborate with an example the Dijkstra's algorithm for shortest path in a graph.

8. Explain P, NP, NP-Complete and NP-Hard Problems with two examples for each class of problems.

SECTION-E

9. Answer briefly :

a. Why does the complexity of an algorithm need to be analysed?

b. What is Hashing?

c. Compare Linear search and Binary search.

d. What is Selection sort? What is its complexity?

e. What is an AVL tree?

f. What is pruning in backtracking?

g. What is Depth First Search? Give an example.

h. Explain Branch and Bound approach with an example.

i. What is the difference between Greedy and Dynamic programming algorithms?

j. What is post-order traversal of a tree?