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Total No. of Pages : 02

Total No. of Questions : 18

**MCA (Sem.-3)**  
**DESIGN & ANALYSIS OF ALGORITHMS**  
Subject Code : PGCA-1920  
Paper ID : 78396

Time : 3 Hrs.

Max. Marks : 70

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

**SECTION-A**

**Write short notes on :**

- 1) How is the time complexity measured?
- 2) What is a deterministic algorithm?
- 3) What do you mean by the running time of an algorithm?
- 4) What are P and NP problems?
- 5) What is the working principle of quicksort?
- 6) What are the various tree traversal techniques?
- 7) What are the important characteristics of dynamic programming?
- 8) What are NP-complete algorithms?
- 9) What do you understand by the Divide and Conquer strategy?
- 10) What is the significance of upper and lower bounds?

### SECTION-B

11) Find the Big-Oh notations for the following function :

a)  $f(n) = 78889$

b)  $f(n) = 6n^2 + 135$

c)  $f(n) = 7n^2 + 8n + 56$

d)  $f(n) = n^4 + 35n^2 + 84$

12) Order the following functions by growth rate :

$N, N^{1.5}, N^2, N \log \log N, N \log^2 N, N \log(N^2), 2/N, 2^N, 2^{N/2}, 37, N^2 \log N, N^3$ . Indicate which functions grow at the same rate.

13) Solve the following instance of the knapsack problem using branch and bound technique ( $W = 15$ )

Items	W	V
I1	9	15
I2	6	6
I3	7	5
I4	2	1

14) Discuss the solution of 4-Queen's problem using backtracking.

### SECTION-C

15) a) Distinguish between deterministic and non-deterministic algorithms.

b) Explain the concept of P, NP and NP-completeness.

16) Define depth-first search. Write an algorithm for DFS, discuss its time complexity. Also, illustrate with an example.

17) What is NP Completeness? Is  $P = NP$ ? Explain.

18) Write an algorithm to perform heap sort. Illustrate its working through an example.

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