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**MCA 4th Semester Examination**  
**Fundamentals of Computer Algorithms (NS)**

**MCA-401**

**Time : 3 Hours**

**Max. Marks : 60**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all selecting one from each of the Sections A, B, C & D. Section E is compulsory.

**SECTION - A**

1. (a) Define an algorithm. How algorithm differs from a (i) program, (ii) flowchart? (6)
- (b) Write a recursive algorithm to generate Fibonacci Series. (6)
2. (a) Define order of growth of an algorithm. Compare order of growth  $n^2$  and  $n \log n$ . (6)
- (b) What is time complexity of an algorithm? Compare time complexity and space complexity. (6)

**SECTION - B**

3. (a) Explain the problem of Job Sequencing With Deadlines using suitable example. (6)
- (b) Show that merge sort has time complexity  $O(n \log n)$ . (6)
4. (a) Apply quick sort to arrange the series 45, 78, 32, 4, 1, 32, 52, 1 in ascending order. Show result at each step. (6)

**[P.T.O.]**

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- (b) Define spanning tree. How will you use Prim's algorithm to find minimum spanning tree? Illustrate using an example. (6)

### SECTION - C

5. (a) Explain dynamic programming technique. How it can be used to solve the knapsack problem? (6)
- (b) Define a binary tree. Write an algorithm to find the height of a given binary tree. (6)
6. (a) Write an algorithm to find out bi-connected components in a given graph. Explain using an example graph. (6)
- (b) Explain depth first search with example. Which data structure can be used to implement depth first search? (6)

### SECTION - D

7. (a) Explain 8 Queens problem. Draw a state tree for 4 Queens problem. (6)
- (b) Define Hamilton Cycle and write algorithm for it. (6)
8. (a) Explain the basic concepts of P, NP, NP-Complete and NP-Hard. (6)
- (b) Define Graph Coloring Problem. Suggest a method to solve the Graph Coloring Problem with explanation of its time complexity. (6)

### SECTION - E

9. (a) How collisions are resolved in hashing?
- (b) Define greedy approach.
- (c) Explain code optimization problem.
- (d) What is a Heap?
- (e) What is the diameter of a graph?
- (f) Explain game tree. (2×6=12)
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