

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2064)

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MCA 4th Semester Examination
Fundamentals of Computer Algorithms
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) Explain briefly Big Oh, Theta and Omega notations. (6)
(b) Write an algorithm which inputs a simple graph and outputs whether or not the graph is connected. (6)
2. (a) Explain heap data structure. Give two applications of heap in computer science. (6)
(b) Define an algorithm. Explain desirable characteristics of a good algorithm. (6)

SECTION - B

3. (a) Apply merge sort to arrange the series 45, 78, 32, 4, 1, 32, 52, 1 in ascending order. Show result at each step. (6)
(b) Explain selection sort with suitable example. What is its worst case time complexity? (6)

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4. (a) Insert the following numbers into a binary search tree in the order of their appearance and draw the resulting tree. 78, 35, 6, 8, 12, 3, 86. (6)
- (b) Define spanning tree. How will you use Kruskal's algorithm to find minimum spanning tree? Illustrate using an example. (6)

SECTION - C

5. (a) Differentiate between dynamic programming and divide & conquer using suitable examples. (6)
- (b) Define travelling salesman problem. Apply branch and bound technique to solve travelling salesman problem. (6)
6. (a) Give an algorithm to identify articulation points and to construct biconnected components. Explain with an example. (6)
- (b) What is difference between a directed and undirected graph? Draw a complete undirected graph on four vertices. Prove that the number of edges in a n vertex complete graph is $n(n-1)/2$. (6)

SECTION - D

7. (a) Explain the basic concepts of P, NP, NP-Complete and NP-Hard. (6)
- (b) Define Sum of Subset Problem. Suggest a method to solve the Sum of Subset problem with explanation of its time complexity. (6)
8. (a) Prove that vertex cover problem is NP-hard. (6)
- (b) What is backtracking? Explain 8 Queens problem as an example of backtracking. (6)

SECTION - E

9. (a) Define knapsack problem.
- (b) What do you understand by hashing?
- (c) Explain average case analysis with an example
- (d) Define graph coloring.
- (e) Explain breadth first search.
- (f) Define a greedy algorithm. (2×6=12)