15271

B. Tech 7th Semester Examination

Analysis and Design of Algorithms (OS)

CS-7003

Time : 3 Hours   **Max. Marks : 100**

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) Describe an algorithm. Explain big omega notation used to describe complexity of an algorithm. (10)

   (b) Explain the binary search technique by using an example. Derive its time complexity. (10)

2. (a) What is recursion? Write a recursive algorithm to compute value of n! for an arbitrary nonnegative integer n. Describe its time complexity. (10)

   (b) Define heap data structure. Explain how heaps are used to implement priority queues. (10)

SECTION - B

3. (a) What are the main differences between BFS and DFS? Which one is preferable and when? (10)

   (b) Apply merge sort to arrange the series 15, 18, 12, 4, 11, 2, 12, 1 in ascending order. Show result at each step. (10)

4. (a) Write the algorithm for quick sort and derive its time complexity. (10)

   (b) How dynamic programming is different from divide and conquer technique? Describe solution for knapsack problem using dynamic programming. (10)

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SECTION - C

5. (a) Describe graph coloring problem. Suggest a solution to this problem using; backtracking technique. (10)

   (b) Define spanning tree. How will you use Kruskal's algorithm to find minimum spanning tree? What is complexity of this algorithm? (10)

6. (a) Explain branch and bound technique with the help of suitable example. (10)

   (b) What is a shortest path in a graph? Explain Dijkstra's algorithm to find shortest path in a given graph. (10)

SECTION - D

7. (a) What is comparison tree? Explain with the help of example. (10)

   (b) State and explain Cook's theorem. (10)

8. (a) What are NP, NP complete and NP hard problems? (10)

   (b) What is time space tradeoff? How this concept is used in dynamic programming? (10)

SECTION - E

9. (a) List characteristics of a good algorithm.

   (b) Describe the 4-queens problem.

   (c) What is a non-linear data structure? Give example.

   (d) What is in-order processing of a tree?

   (e) What is a weighted graph?

   (f) Explain any two popular hash functions.

   (g) Which sorting algorithm is best if the list is already sorted? Why?

   (h) Explain adjacency list representation of a graph.

   (i) Which data structure is used for implementing recursion? List different possible operations over this data structure.

   (j) Define Hamiltonian cycle. (2×10=20)