MCA (Sem–2)
DESIGN AND ANALYSIS OF ALGORITHMS
Subject Code : PGCA-1920
M.Code : 79616
Date of Examination : 11-05-2024

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

1. Write briefly :

   a. What is difference between an algorithm and a program?

   b. State principle of optimality.

   c. What do you mean by control abstraction?

   d. What are implicit and explicit constraints?

   e. How is randomized quicksort algorithm different from quicksort algorithm?

   f. What is the time complexity of conventional matrix multiplication method and Strassen's matrix multiplication method?

   g. Prove that if $f_1(n) = O(g_1(n))$ and $f_2(n) = O(g_2(n))$, then $f_1(n) + f_2(n) = O(max(g_1(n) + g_2(n)))$.

   h. Define the following terms in context of backtracking : E-node, live node, and dead node.

   i. What do you mean by recurrence relations? How are they solved?

   j. What are NP-hard and NP-complete problems?

SECTION-B

2. What are asymptotic notations? Describe with the help of examples various commonly used asymptotic notations.

3. What is 0/1 Knapsack, problem? Describe how 0/1 knapsack problem can be solved using branch- and-bound algorithm design strategy. Using LCBB, solve the following instance of 0/1 knapsack problem: n=5, p()=(10, 15, 6, 8, 4), w()=(4, 6, 3, 4, 2) and m=12.

4. What do you mean by Hamiltonian circuit? Describe how Hamiltonian circuit problem can be solved using backtracking algorithm design strategy?

5. What do you mean by control abstraction? Using the control abstraction, describe in detail greedy approach of algorithm design.

SECTION-C

6. Describe quicksort algorithm for sorting a given list of elements. Perform its average and worst-case time complexity analysis. Is quicksort algorithm stable?

7. Describe in detail breadth-first search and depth-first search. What are the applications of each method?

8. Describe the problem classes - P, NP, NP-hard and NP-complete by giving an example of each class.

9. What is string matching? Describe a string-matching algorithm. Analyze the time and space complexity of the described algorithm.

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