MAY-24-0473

CS-506 (Analysis & Design of Algorithm (CSE, IT))

B.Tech-5th (CBCS)

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 question each from section A, B, C and D. Q. No.9 is compulsory.

SECTION-A

1. Describe the difference between worst-case, average-case, and best-case time complexity analysis. How can these analyses be used to evaluate an algorithm's performance in different scenarios?   (10)

2. (a) Explain the concept of an algorithm and how it differs from a program.   (5)

   (b) Solve the following recurrence relation using Master's theorem

      $T(n) = 3T(n/2) + n^2$ (5)

SECTION-B

3. Explain how matrix chain multiplication can be solved using dynamic programming. Write the algorithm and analyse it for the time complexity.   (10)

4. Using the divide and conquer approach find the maximum and minimum in the set of 'n' elements. Also, what is the recurrence relation for the number of elements compared during the process, and how can it be solved?   (10)

SECTION-C

5. Explain differences between Prim's and Kruskal's Minimum spanning Tree algorithm. Derive the time complexity of Kruskal's algorithm.   (10)

6. Apply the Bellman Ford algorithm on the following directed graph to find out the shortest path between source 's' to destination 'z'   (10)
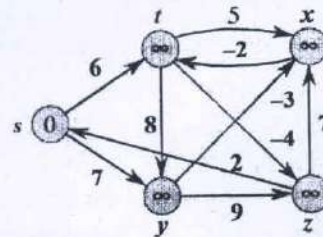
SECTION-D

7. What is the Ford-Fulkerson algorithm, and how does it work? Discuss the time complexity of the Ford-Fulkerson algorithm.   (10)

8. Discuss NP-Hard, NP-Complete Problems. For given problems X and Y, Y is NP-complete and X reduces to Y in polynomial time. Prove that X is in NP but not necessarily in NPC.   (10)

SECTION-E (Compulsory)

9. a. Discuss the difference between Posteriori and Priori analysis of an algorithm.

SECTION - E (Compulsory)

9. (a) What factors account for the loss of energy in a laminar flow?

   (b) Define momentum thickness and energy thickness.

   (c) Differentiate between G.V.F and R.V.F.

   (d) What is Manning's formula?

   (e) What is specific energy curve?

   (f) Define critical flow.

   (g) What are the assumptions of gradually varying flow profile?

   (h) Differentiate between turbines and pumps.

   (i) What is the basic difference between single stage and multi stage pumps?

   (j) Define slip, percentage slip and negative slip of a reciprocating pump.   (10×2=20)