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16143(D) - 0 DEC 2016

B. Tech 5th Semester Examination

Analysis & Design of Algorithms (NS)

CS-313

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 question from each of the sections A, B, C & D of the question paper and all the subparts of the question in Section E.

SECTION - A

1. (a) What is an Algorithm? Discuss the role of algorithms in computing. (10)

   (b) What are the methodologies for analyzing algorithms? Compare. (10)

2. What do you mean by Asymptotic notation? Define θ-notation, O-notation and Ω-notation with examples. (20)

SECTION - B

3. (a) Show that Quicksort's best-case running time is $\Omega (n \log_2 n)$. (10)

   (b) Differentiate between linear search and binary search algorithms. (10)

4. What is Backtracking? Find a solution to the 8-queens problem using backtracking strategy. Draw the solution space using necessary bounding function. (20)

SECTION - C

5. Suppose that the graph G = (V, E) is represented as an adjacency matrix. Give a simple implementation of Prim's algorithm for this case that runs in O (V^2) time. (20)

6. (a) Explain Oracle and adversary arguments in relation to Lower Bound theory. (10)

   (b) What are approximation algorithms? Explain the approximation algorithms for vertex cover problem. (10)

SECTION - D

7. Discuss the Ford-Fulkerson method to compute the maximum flow in a flow network. Also explain its complexity. (20)

8. (a) What do you mean by NP-complete problems? Give examples. (10)

   (b) Prove that the class NP of languages is closed under union, intersection, concatenation and Kleene star. (10)

SECTION - E

9. (a) Write two characteristics that distinguish dynamic algorithm from greedy algorithm.

   (b) What is the traveling-salesman problem with triangle inequality?

   (c) What is a minimum cost spanning tree?

   (d) Kruskal's algorithm is faster than Prim's algorithm. Justify the statement.

   (e) Differentiate between deterministic and nondeterministic polynomial time algorithms. (4×5=20)