

SECTION - C

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

- (a) What is an Algorithm? Discuss the role of algorithms in computing. (10)
(b) What are the methodologies for analyzing algorithms? Compare. (10)
- What do you mean by Asymptotic notation? Define θ -notation, O-notation and Ω -notation with examples. (20)

SECTION - B

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

SECTION - D

- 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)
- (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 - E

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