Reg.No. [redacted]

24593

Velammal College of Engineering and Technology

Viraganoor, Madurai – 625 009
(Autonomous)

B.E./B.Tech End Semester Examinations April 2025

Fourth Semester
Time : 3 Hours

Regulation 2021
Max. Marks 100

21CS207 - Design and Analysis of Algorithm
(Common to Computer Science and Engineering & Information Technology)

Answer ALL Questions

PART-A (10 x 2 = 20 Marks)

1. Why do we need to analyse an algorithm?
2. How do you measure and express the running time of an algorithm?
3. What are the applications of brute force?
4. State the travelling salesman problem.
5. Show the general procedure of dynamic programming.
6. How does Floyd's Algorithm work?
7. What is meant by maximum – Flow problem?
8. Define stable marriage problem.
9. State Hamiltonian Circuit Problem.
10. What are the searching techniques that are commonly used in Branch-and-Bound method?

Part – B (4 x 16 = 64 Marks)

11. a) Write the asymptotic notations used for best case, average case and worst-case analysis of algorithms. Also write an algorithm of finding maximum element of an array and perform best, worst and average case complexity with appropriate order notations.

OR

b) Solve the following recurrence relation using master theorem,

a. $T(n) = 8T(n/2) + n^2$ b. $T(n) = 9T(n/3) + n$

12. a) Write and explain the algorithm to sort a set of N numbers using Quick sort with an example.

OR

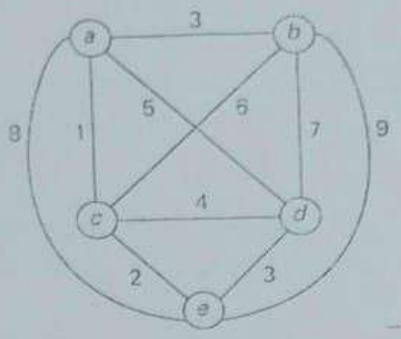
b) Explain how greedy method can be applied to solve the knapsack problem.

13. a) Justify the subset of bipartite graph is bipartite? Outline with an example.

OR

b) Discuss in detail about maximum flow problem with an example.

14. a) Solve the travelling salesman problem using branch and bound technique.

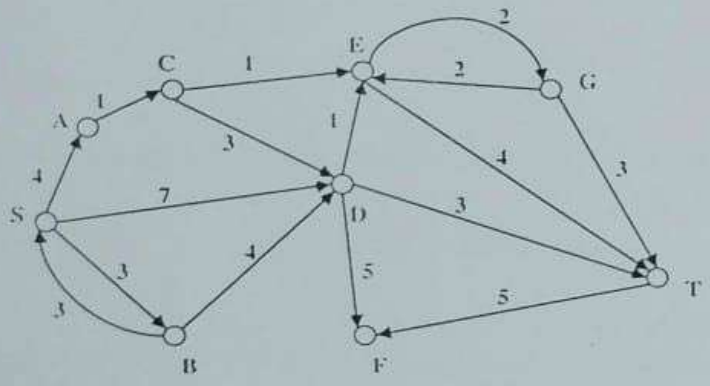


OR

b) How can backtracking be applied to find all possible configurations for placing N queens on an NxN chessboard such that no two queens attack each other? Can you break down the solution into a clear algorithm and illustrate it with an example?

Part – C (1 x 16=16 Marks)

15. a) Consider the directed graph shown in the figure below. There are multiple shortest paths between vertices S and T. Which one will be reported by Dijkstra's shortest path algorithm? Assume that, in any iteration, the shortest path to a vertex v is updated only when a strictly shorter path to v is discovered.



OR

b) A message is made up entirely of characters from the set X={P,Q,R,S,T}. The Table of probabilities for each of the characters is shown below:

Character	Probability
P	0.22
Q	0.34
R	0.17
S	0.19
T	0.08
Total	1.00

If a message of 100 characters over X is encoded using Huffman coding, what is the expected length of the encoded message in bits?