

BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - V Computer Science & Business Systems : WINTER: 2025
SUBJECT: DESIGN & ANALYSIS OF ALGORITHMS

Day : Monday
Date : 08/12/2025

W-24166-2025

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.

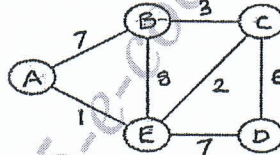
- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat labeled diagrams **WHEREVER** necessary.

- Q.1** Explain Asymptotic notations with suitable diagram. (10)
- i) Theta (Θ).
 - ii) Big Oh (O).
 - iii) Big Omega (Ω).

OR

- Q.1** Explain the following methods to solve recursions using suitable examples: (10)
- i) Master's method.
 - ii) Recursion tree method.
 - iii) Substitution method.

- Q.2** Write an algorithm to find the shortest path in a graph from single source that uses Greedy Strategy. Also discuss the running time of that algorithm. Find out the shortest path in the given graph considering A as the source vertex. (10)

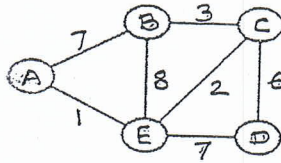


OR

- Q.2** What is greedy strategy? Write algorithm for Fractional Knapsack problem. (10)
Discuss its running time. Solve the numerical to find the profit. The capacity of the bag is 60 units.

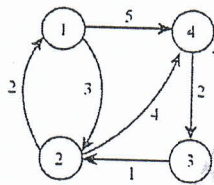
Item no	1	2	3	4	5	6	7
Weight (w_i)	10	10	10	20	20	30	40
Profit (p_i)	30	50	60	100	75	130	150

- Q.3 Write an algorithm to find the shortest path in a graph from a single source that uses Dynamic Programming. Discuss the running time of that algorithm. Find out the shortest path in the given graph. Consider A as the source node. (10)

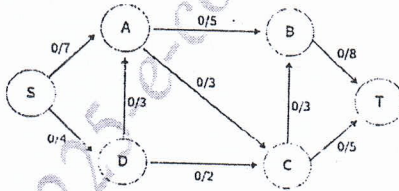


OR

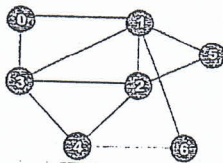
- Q.3 What is Dynamic Programming? How is it different than Divide and Conquer strategy? Write an algorithm to find all pair shortest paths. Discuss running time. Solve for the given graph. Also show the parent matrix. (10)



- Q.4 Explain the Maximum Network Flow problem as an optimization problem using Ford Fulkerson Algorithm. Find out the Maximum Network Flow in the given graph. S is Source and T is sink. (10)



- Q.4 Explain the graph traversal technique that uses queue. Write the algorithm and discuss its running time. Also apply on the graph considering 0 as the source vertex. (10)



- Q.5 Explain with suitable example polynomial time verification and polynomial time reduction. (10)

OR

- Q.5 Define P, NP, NP-Hard and NP-Complete problems. Prove SAT is NP-Complete. (10)

- Q.6 What are approximation algorithms? Explain with examples. (10)

OR

- Q.6 How do the complexity classes NP and P-SPACE relate to each other in terms of computational complexity? Some problems are known to be in NP but not known to be in P-SPACE, and vice versa. Justify. (10)
