

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3150703****Date:02-12-2025****Subject Name: Analysis and Design of Algorithms****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	MARKS
Q.1 (a) State the time complexity of following problems in descending order: Matrix multiplication, inserting element in binary search tree, inert node at beaning in linked list, linear search, selection sort, merge sort.	03
(b) Summarize and explain the properties of algorithm	04
(c) Apply bubble sort on the given data sequence: 77, 22, 55, 11, 33, 66, 44	07
 Q.2 (a) Write the algorithm for binary search	03
(b) Identify the constant c, n ₀ and upper bound for given recurrences: $T(n) = 4n^2 + 3n - 4$ $T(n) = 6n^3 - 8n^2 + 9n + 2$	04
(c) Illustrate and solve recurrence for best and worst case of quick sort	07
OR	
(c) Construct solution using Merge sort on the given data sequence: 88, 77, 22, 55, 11, 33, 66, 99, 44. Also state its recurrence and solve it.	07
Q.3 (a) Define principle of Optimality. Discuss with example.	03
(b) Differentiate: Dynamic programming vs divide and conquer	04
(c) Solve following instance of knapsack problem using dynamic programming: W = [1, 2, 5, 6, 10], V = [1, 6, 18, 22, 30] and Knapsack capacity M = 12	07
OR	
Q.3 (a) Define the characteristics of greedy algorithms	03
(b) Explain activity selection problem.	04
(c) Infer the Longest Common Subsequence for following strings: X = 10010100 Y = 10011	07
 Q.4 (a) State and explain methods to represent the graph	03
(b) Differentiate: BFS vs DFS	04

- (c) Outline algorithm for Prim's method and find MST for given graph using Prim's method 07

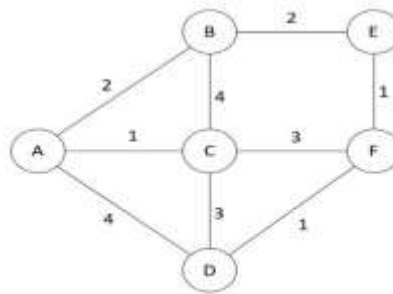


Figure 1

Figure 1

OR

- Q.4** (a) Define Articulation point, Acyclic Directed Graph, Back Edge 03
 (b) Find prefix code for given data. A: 45, B: 30, C: 15, D: 12, E: 8 04
 (c) Outline algorithm for Kruskal's method and find MST for the graph given in Figure 1, using Kruskal's method 07
- Q.5** (a) Show naïve string matching algorithm with example. 03
 (b) Find topological sequence of vertices for the graph given in Figure 1. Consider A is starting vertex. 04

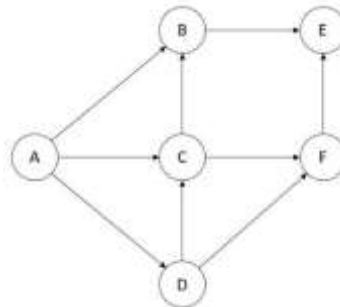


Figure for Question 5(B)
for Topological sort

- (c) Explain backtracking method. What is 4 queen problem? Show its all possible solutions. 07

OR

- Q.5** (a) Explain polynomial time reduction 03
 (b) Compare and contrast: Backtracking vs. Branch and Bound 04
 (c) What do you mean by spurious hits? For modulo $q=13$, how many spurious hits does the Rabin-Karp encounters for the text $T = 4359023141526739921$ when looking for the pattern $P = 31415$? 07
