THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

Estd. 2003

IN-SEMESTER EXAMINATION-1
T.E. (Semester-VI)
SUBJECT – PE - I Analysis of Algorithms

Branch: Information Technology
Div.: ALL
Duration: 60 Minutes

Date:11/03/2025
Timing: 4:00 TO 5:00 PM
Maximum Marks: 20

Instructions –

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

Q.1		Answer any 5 of the following questions	Marks	Course Outcomes	Learning Levels
	a.	Differentiate Substitution method and Masters Theorem	2	1	AN
	b.	State the formulas and three cases of Master theorem	2	1	U
	c.	List the advantages and disadvantages of Substitution method	2	1	R
	d.	State the time complexity of AVL trees and Huffman encoding	2	2	AN
	e.	State the properties of B Trees	2	2	AN
	f.	Describe the key steps involved in the optimal merge pattern algorithm	2	3	R
	g.	What is the optimal sequence of following jobs using greedy approach?	2	3	AN

JOBS	J1	J2	J3	J4	J5
PROFIT	60	25	20	55	10
DEADLINE	2	1	2	1	1

Q.2	a.	Construct a 2-3 tree for the following nodes. **50,60,70,40,30,20,10,80,90,100**	5	2	U
		OR			
	b.	Explain Trie Data Structure with an Example. Discuss the applications of trie data structures and state its time complexity	5	2	A
Q.3	a.	Suppose you have a knapsack with a capacity of 20 units and the following items with their respective weights and values: **Item 1: Weight = 5 units, Value = 12** **Item 2: Weight = 8 units, Value = 20** **Item 3: Weight = 10 units, Value = 15** Determine the optimal way to fill the knapsack to maximize the total value using the Fractional Knapsack algorithm.	5	3	AN
		OR			
	b.	Explain Optimal Merge Pattern in detail along with an example.	5	3	R

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

IN-SEMESTER EXAMINATION-II

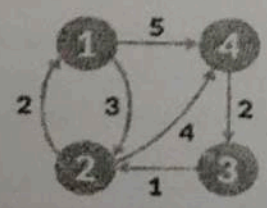
TE (Semester-VI)

SUBJECT – Professional Elective I - Analysis of Algorithms (AOA)

Branch: IT
Div.: ALL
Duration: 60 Minutes
Instructions –

Date: 16/4/2025
Timing: 2:00 PM to 3:00 PM
Maximum Marks: 20

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Diagrams / sketches should be given wherever necessary.
4. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5. Figures to the right indicate full marks.

Q.1		**Answer any 5 of the following questions**	**Marks**	**Course Outcomes**	**Learning Levels**
	a.	Define a Hamiltonian cycle in a graph.	2	4	R
	b.	Draw the possible solutions of 8 Queen Problem	2	4	U
	c.	Discuss the primary purpose of the Bellman-Ford algorithm?	2	5	U
	d.	Explain the objective of the 0/1 knapsack problem?	2	5	U
	e.	Discuss the basic idea behind the naïve string-matching algorithm.	2	6	U
	f.	State the time complexity of any two string matching algorithms	2	6	R
	g.	Define the Rabin-Karp algorithm.	2	6	R
Q.2	a.	Define a flow network. Explain the concept of an augmenting path in the context of flow networks.	5	4	R
		OR			
	b.	Compare and contrast the approaches of backtracking and dynamic programming in problem-solving.	5	4	U
Q.3	a.	Discuss real-world applications of the Travelling Salesman Problem in various domains such as logistics, transportation, and computer science. Provide examples of how solving the TSP optimally or heuristically can lead to practical solutions.	5	5	AN
		OR			
	b.	Apply Floyd Warshall algorithm to find the shortest path for the below-mentioned graph 	5	5	A

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

END SEMESTER EXAMINATION, MAY 2025
T.E. SEMESTER VI (CBCGS-HME 2023)

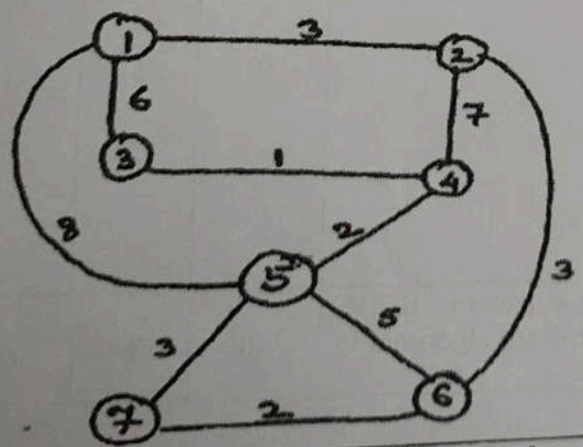
Branch:	**IT**	**Q.P. Code:**	**T662RM254PE-1-1-1**
Subject:	**PE I - Analysis of Algorithms**	**Duration:**	**2 hours**
Subject Code:	**PEC-IT 6015**	**Max. Marks:**	**60**

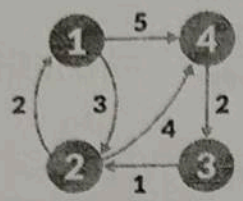
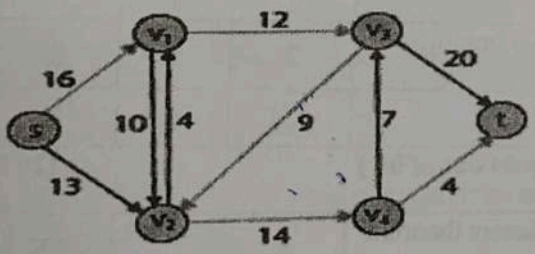
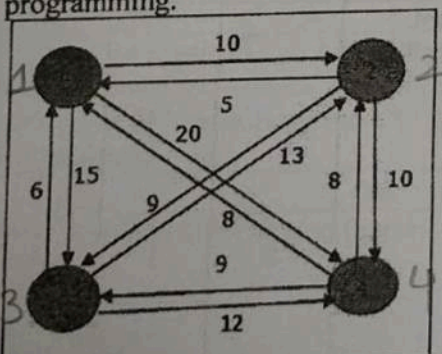
Instructions:
1. **All sections are compulsory**
2. **Figures to the right indicate full marks.**
3. **Assume suitable data if necessary and state the assumptions clearly.**

Section-I **Short Answer Questions (Answer any 05 questions out of 06)** **(10 Marks)**
(Fundamental, Core Types)

Q. No.		Marks	CO	RBT Level	PI
1	State the properties of an algorithm	2	1	U	2.8.2
2	Define the term 'Huffman coding'. What is the main objective of the Huffman algorithm?	2	2	R	4.4.1
3	Define Fractional Knapsack Problem in Detail.	2	3	R	4.4.1
4	Draw the possible solutions of 4 Queen Problem	2	4	U	4.5.1
5	Discuss the time complexity of most dynamic programming algorithms?	2	5	R	1.7.2
6	List out any three algorithms of string Matching.	2	6	R	1.7.1

Section-II **Descriptive Answer Questions(Answer any 04 out of 06)** **(20 Marks)**
(Descriptive, Comprehension Types)

1	Solve the following recurrence equation using Masters theorem $T(n) = 8T(n/4) + n^2$	5	1	AN	2.7.2
2	Explain Trie Data Structure with an Example. Discuss the applications of trie data structures and state its time complexity	5	2	AN	2.8.2
3	Find the minimum spanning tree using Kruskal's algorithm. Show the step by step construction of Minimum Spanning Tree 	5	3	A	1.7.1
4	Compare and contrast the approaches of backtracking and dynamic programming in problem-solving.	5	4	U	2.6.4
5	Apply Floyd Warshall algorithm to find the shortest path for the below-mentioned graph	5	5	AN	4.5.1

					
6	Given a text T = "ababcabcabababd" and pattern P = "ababd", trace the Naïve String Matching Algorithm step by step and find all occurrences of P in T.	5	6	A	4.4.1
Section-III	**Long Answer Question (Answer any 03 out of 05) (Application, Analytical, Evaluation, Design Type)**				**(30 Marks)**
1	Construct the Trie Structure using the following words. TEACHER , TEAM, TECH, TEXT, STUDENT, STUDY, STUDIOS, IT	10	2	A	1.7.2
2	a) Explain Knapsack PROBLEM (procedure) using Greedy Algorithm with an example b) Demonstrate an algorithm of Fractional Knapsack problem and state its time complexity	10	3	U	2.8.2
3	Consider a flow network with the following capacities:  Ford-Fulkerson method to find the maximum flow.	10	4	AN	2.7.1
4	Solve following Travelling Salesman Problem using dynamic programming. 	10	5	A	6.6.1
5	Given a text string "ABCDEABCD" and a pattern "BCD", perform a step-by-step analysis of the Rabin-Karp algorithm to find all occurrences of the pattern in the text.	10	6	A	3.2.2