Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER – II (New)– EXAMINATION – WINTER-2019

Subject Code: 3720216   **Date: 18-11-2019**
Subject Name: Advance Algorithms
**Time: 02:30 PM TO 05:00 PM**   **Total Marks: 70**

Instructions:
    1. **Attempt all questions.**
    2. **Make suitable assumptions wherever necessary.**
    3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What is Topological Sorting? Write an algorithm to find topological sorting of a graph. Describe with example.	**07**
	(b)	Define: Matching in a graph, Maximal Matching, M-alternating Path, M-augmenting path	**04**
	(c)	Define positive wrapped convolution and negative wrapped convolution of two vectors	**03**
Q.2	**(a)**	Answer the following questions:	**04**
		1. What is approximation algorithm? Give approximate algorithm for travelling salesman problem	
		2. How to convert linear program into slack form? What is slack variable?	**03**
	(b)	Explain Shortest path by BFS. Give correctness proof of the algorithm.	**07**
		OR	
	(b)	Write and explain an algorithm to compute a maximum matching in a graph.	**07**
Q.3	**(a)**	Consider following flow network. Apply two iterations of Ford-Fulkerson algorithm on it.	**07**
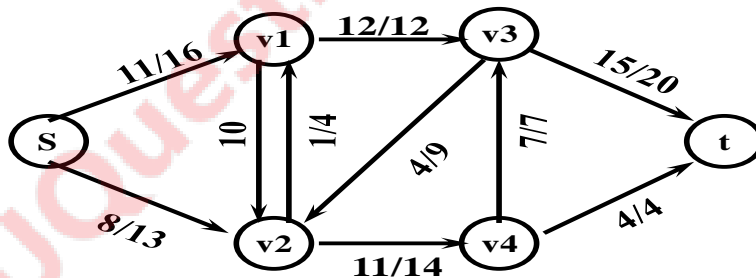
	(b)	Demonstrate with example the process of LU decomposition of a given matrix	**07**
		OR	
Q.3	**(a)**	Define flow and flow network. What is residual network and how it is constructed? Explain with example	**07**
	(b)	Find LU decomposition of the following matrix	**07**

$$\begin{bmatrix} 3 & 1 & 6 \\ -6 & 0 & -16 \\ 0 & 8 & -17 \end{bmatrix}$$

Q.4	**(a)**	Describe all pairs shortest path problem. Explain how it can be solved using dynamic programming.	**07**

(b) Suppose we are given x ≡ 2 (mod 6) , x ≡ 1 (mod 5) and a ≡ 3 (mod 7). **07**
Compute "x" using Chinese remainder theorem

OR

Q.4 **(a)** State and prove Chinese remainder theorem. **07**
(b) Discuss how all pairs shortest path problem is solved by using Floyd- **07**
Warshall algorithm

Q.5 **(a)** Answer the following questions:
1. Define weighted matroid. Give example of weighted matroid. **03**
2. Write a short note on NP-Complete problems **04**
(b) Explain simplex algorithm to solve linear programs **07**

OR

Q.5 **(a)** Answer the following questions:
1. Sort the following data with Insertion Sort Method: 65, 75, 5, 55, **03**
25, 30, 90, 45, 80.
2. Discuss the applications of linear programming. **04**
(b) Specify vertex cover and set cover problems. Explain with example **07**
how vertex cover problem can be reduced to set cover problem. .

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