



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar , Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

End Semester Examination-May 2021

Max. Marks:- 60

Class: SE(Comp and IT)

Course Code:- MA201

Name of the Course: Linear Algebra

Duration: 2 Hours

Semester:- IV

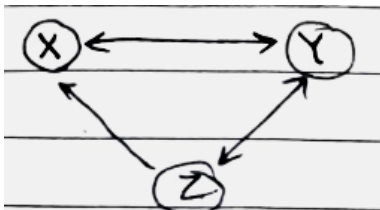
Branch:- COMP & IT

Instructions:

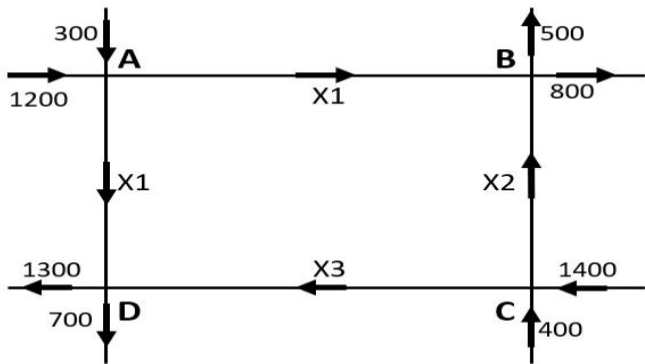
1) All Questions are Compulsory.

2) Assume suitable data if necessary.

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Q No.		Max. Marks	CO
Q.1	<p>a) Let R^3 have the Euclidean inner product. Use the Gram Schmidt process to transform the basis $\{u_1, u_2, u_3\}$ into orthonormal basis where $u_1 = (1, 0, 0)$, $u_2 = (3, 7, -2)$, $u_3 = (0, 4, 1)$.</p> <p style="text-align: center;">OR</p> <p>a) For what value of λ, the following vectors are linearly dependent ? $(\lambda, -\frac{1}{2}, -\frac{1}{2})$, $(-\frac{1}{2}, \lambda, -\frac{1}{2})$, $(-\frac{1}{2}, -\frac{1}{2}, \lambda)$.</p> <p>b) Find the highest Page Rank from the given directed graph. Do till 3 iterations.</p>  <p>c) Using a suitable 2×2 matrix, Encode and decode the message NOW * STUDY</p>	<p>5</p> <p>5</p> <p>5</p> <p>5</p>	<p>4</p> <p>4</p> <p>6</p> <p>3</p>

Q.2	<p>a) Apply Crout's Method to solve the following equations</p> $x - y + 2z = 2$ $3x + 2y - 3z = 2$ $4x - 4y + 2z = 2$	8	2														
	<p>b) Check whether the following set of vectors is a basis for P_2.</p> $S = \{1 - 3x + 2x^2, \quad 1 + x + 4x^2, \quad 1 - 8x + x^2\}$ <p>Find the coordinate vector of $p = 1 - 2x + x^2$ with respect to the above basis.</p>	7	4														
	<p style="text-align: center;">OR</p> <p>b) Find the basis for null -space, column space and row space for</p> $A = \begin{bmatrix} 2 & -4 & 1 & 2 & -2 & -3 \\ -1 & 2 & 0 & 0 & 1 & -1 \\ 10 & -4 & -2 & 4 & -2 & 4 \end{bmatrix}$	7	4														
Q.3	<p>a) Show that the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is diagonalizable.</p> <p>Find the Transforming matrix and the Diagonal matrix.</p>	8	5														
	<p>b) Solve the system of differential equation $y' = \begin{bmatrix} 1 & 1 \\ 4 & -2 \end{bmatrix} y$ using diagonalizable with initial conditions</p> <p>$y_1(0) = 1$ and $y_2(0) = 6$.</p>	7	6														
Q.4	<p>a) Fit a curve of the form $y = a + bx + cx^2$ for the following data using Least square Method.</p> <table><tr><td>X</td><td>:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Y</td><td>:</td><td>1</td><td>1.8</td><td>1.3</td><td>2.5</td><td>6.3</td></tr></table>	X	:	0	1	2	3	4	Y	:	1	1.8	1.3	2.5	6.3	7	4
X	:	0	1	2	3	4											
Y	:	1	1.8	1.3	2.5	6.3											

	<p>b) Determine the dimension of the solution space of the following homogeneous system</p> $x - y + 2z = 0,$ $2x + y = 0,$ $x - 4y + 6z = 0$ <p>c) If x_1, x_2, x_3, x_4 are the number of vehicles travelling through each road per hour. Find x_1, x_2, x_3, x_4 from the traffic diagram given below :-</p>  <p>The traffic diagram shows a network of roads with four nodes labeled A, B, C, and D. At node A, there is an inflow of 1200 vehicles from the left and an outflow of 300 vehicles upwards. At node B, there is an inflow of 800 vehicles from the right and an outflow of 500 vehicles upwards. At node C, there is an inflow of 1400 vehicles from the right and an outflow of 400 vehicles downwards. At node D, there is an inflow of 700 vehicles downwards and an outflow of 1300 vehicles to the left. The unknown flows are: x_1 (flow from A to B), x_2 (flow from C to B), and x_3 (flow from D to C).</p>	4	4
		4	1

***** All the Best *****