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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. | **Semester: IV**
Branch: CS, IS and AI&ML | **Duration: 3 hrs.**
Course Code: 22MA4BSLIA | **Max Marks: 100**
Course: Linear Algebra

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	***CO***	***PO***	**Marks**
1	a)	Show that the set $M=\left\{\begin{bmatrix}0 & a\\ b & 0\end{bmatrix} \Big/ a,b\in\mathbb{R}\right\}\subset M_{2\times 2}$ satisfies all the properties of a vector space over the field of reals under standard matrix addition and scalar multiplication.	*CO1*	*PO1*	**6**
	b)	Does there exist non-zero scalars c_1, c_2, c_3 and c_4 which proves that the vectors $v_1=(0,1,2,3,0)$, $v_2=(1,3,-1,2,1)$, $v_3=(2,6,-1,-3,1)$ and $v_4=(4,0,1,0,2)$ in $\mathbb{R}^5$ are linearly dependent? If yes, find them.	*CO1*	*PO1*	**7**
	c)	Determine a subset of $S=\{p_1,p_2,p_3,p_4\}\subset P_3(t)$, the vector space of polynomials that forms a basis of $W=span(S)$ if $p_1=t^3+t^2$, $p_2=2t^3+2t-2$, $p_3=t^3-6t^2+3t-3$ and $3t^2-t+1$.	*CO1*	*PO1*	**7**
		UNIT – II			
2	a)	Consider the matrix $A=\begin{bmatrix}2 & 4\\ 5 & 6\end{bmatrix}$ which defines a linear operator on $\mathbb{R}^2$. Find the matrix of the linear transformation relative to the basis $S=\{u_1,u_2\}=\{(1,-2),(3,-7)\}$.	*CO1*	*PO1*	**6**
	b)	Find the basis for the range space $R(T)$, null space $N(T)$ for the linear transformation $T:\mathbb{R}^4\to\mathbb{R}^3$ given by $T(x,y,z,t)=(x-y+z+t,\ x+2z+t,\ x+y+3z-3t)$ and also verify rank-nullity theorem.	*CO1*	*PO1*	**7**
	c)	Let $G:\mathbb{R}^3\to\mathbb{R}^3$ given by $G(x,y,z)=(x+y,\ x+z,\ y+z)$. (i) Show that G is invertible. (ii) Find G^{-1}.	*CO1*	*PO1*	**7**
		OR			

	3	a)	Let $A=\begin{bmatrix}1 & -3\\ 3 & 5\\ -1 & 7\end{bmatrix}$, $u=\begin{bmatrix}2\\ -1\end{bmatrix}$, $b=\begin{bmatrix}3\\ 2\\ -5\end{bmatrix}$ and $c=\begin{bmatrix}3\\ 2\\ 5\end{bmatrix}$. Define a linear transformation $T:\mathbb{R}^2\to\mathbb{R}^3$ by $T(X)=AX$, for $X\in\mathbb{R}^2$. (i) Find the image of u under the transformation T. (ii) Find an $X\in\mathbb{R}^2$ whose image is b. Is there more than one $X\in\mathbb{R}^2$ whose image is b? (iii) Determine if c is in the range of the transformation.	*CO1*	*PO1*	**6**
		b)	Derive the matrix of the linear transformation $T:\mathbb{R}^2\to\mathbb{R}^2$, which results in horizontal shear of $(x,y)\in\mathbb{R}^2$ by 0.5 units. Determine if there exist i) a preimage of $(1,-3)$. ii) an image of $(3,-1)$.	*CO1*	*PO1*	**7**
		c)	Find the basis for the range space $R(T)$ and the Kernel $N(T)$ of the linear transformation $T:\mathbb{R}^4\to\mathbb{R}^3$ given by the matrix $A=\begin{bmatrix}1 & 2 & 3 & 1\\ 1 & 3 & 5 & -2\\ 3 & 8 & 13 & -3\end{bmatrix}$. Hence verify the rank-nullity theorem. Is T a one-one mapping? Justify.	*CO1*	*PO1*	**7**
			UNIT - III			
	4	a)	Apply Cayley-Hamilton theorem to compute A^{-1} of $A=\begin{bmatrix}1 & 1 & -2\\ -1 & 2 & 1\\ 0 & 1 & -1\end{bmatrix}$.	*CO1*	*PO1*	**6**
		b)	Find the eigenvalues and the eigenvectors of the linear transformation $T:P_1(t)\to P_1(t)$ defined $T(at+b)=(a+2b)t+(4a+3b)$.	*CO1*	*PO1*	**7**
		c)	Find the characteristic and minimal polynomial of $\begin{bmatrix}2 & 5 & 0 & 0 & 0\\ 0 & 2 & 0 & 0 & 0\\ 0 & 0 & 4 & 2 & 0\\ 0 & 0 & 3 & 5 & 0\\ 0 & 0 & 0 & 0 & -7\end{bmatrix}$.	*CO1*	*PO1*	**7**
			OR			
	5	a)	Apply Cayley-Hamilton theorem to compute A^4 if $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 4 & 5\\ 3 & 5 & 6\end{bmatrix}$.	*CO1*	*PO1*	**6**
		b)	Determine the eigenspaces of the linear transformation $T:\mathbb{R}^3\to\mathbb{R}^3$ defined by $T(x,y,z)=(x+y-z,\,0\,,\,x+2y+3z)$.	*CO1*	*PO1*	**7**

		c)	Write all possible Jordan canonical form of the linear transformation $T:\mathbb{R}^3 \to \mathbb{R}^3$ when $\Delta(t)=(t+5)^2(t-7)^3$ is the characteristic polynomial.	CO1	PO1	**7**
			UNIT – IV			
	6	a)	Find a basis of W of $\mathbb{R}^4$ orthogonal to $u_1=(1,-2,3,4)$ and $u_2=(3,-5,7,8)$.	CO1	PO1	**4**
		b)	Find an orthogonal basis and hence an orthonormal basis of the subspace W spanned by $S=\{1,\,1-t,\; t^2\}$ of $P_2(t)$ given $\langle f,g\rangle=\int_0^1 f(t)g(t)\,dt$.	CO1	PO1	**9**
		c)	In an experiment designed to determine the extent of a person's natural orientation, a subject is put in a special room and kept there for a certain length of time. He is then asked to find a way of a maze and record is made of the time it takes the subject to accomplish this task. The following data are obtained. Time in Room (hours): 1, 2, 3, 4, 5, 6 Time to find way out of maze(minutes): 0.8, 2.1, 2.6, 2.0, 3.1, 3.3 Let x denote the number of hours in the room and let y denote the number of minutes that it takes the subject to find his way out. i. Find the least squares line of the form $y=a+bx$. ii. Estimate the time it will take the subject to find his way out of the maze after 10 hours in the room using the equation obtained.	CO1	PO1	**7**
			UNIT – V			
	7	a)	Determine the modal matrix that reduces the quadratic form $x^2+3y^2+3z^2-2yz$ to its canonical form and hence discuss the nature the quadratic form.	CO1	PO1	**10**
		b)	Obtain the singular value decomposition of $A=\begin{bmatrix}-3 & 1\\ 6 & -2\\ 6 & -2\end{bmatrix}$.	CO1	PO1	**10**

Embedded table in 6 c):

Time in Room (hours)	1	2	3	4	5	6
Time to find way out of maze(minutes)	0.8	2.1	2.6	2.0	3.1	3.3

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E **Semester: IV**
Branch: CS/IS/AIML **Duration: 3 hrs.**
Course Code: 19MA4BSLIA **Max Marks: 100**
Course: Linear Algebra **Date: 14.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) Apply LU decomposition method to solve the system of equations $2x+y+4z=12,\ 4x+11y-z=33$ and $8x-3y+2z=20$. **6**

b) Express the polynomial $v=t^2+4t-3$ in $p(t)$ as a linear combination of the polynomials $p_1=t^2-2t+5$, $p_2=2t^2-3t$, $p_3=t+3$. **7**

c) Let W be a subspace of $\mathbb{R}^4$ spanned by the vectors $u_1=(1,-2,5,-3)$, $u_2=(2,3,1,-4)$ and $u_3=(3,8,-3,-5)$. **7**
i) Find the basis and dimension of W.
ii) Extend the basis of W to a basis of $\mathbb{R}^4$.

OR

2 a) Show that the vectors $u_1=(1,1,1),\ u_2=(1,2,3),\ u_3=(1,5,8)$ span $\mathbb{R}^3$. **6**

b) Show that the set $V=\left\{a+b\sqrt{2}\mid a,b\in\mathbb{Q}\right\}$ is a vector space over the field of rationals. **7**

c) Find the dimension and a basis of the solution space W of the system of equations $x+2y+2z-s+3t=0$; $x+2y+3z+s+t=0$ and $3x+6y+8z+s+5t=0$. **7**

UNIT- II

3 a) If $T:\mathbb{R}^3\to\mathbb{R}^3$ defined by $T\left(x,\ y,\ z\right)=(x-y, y+z,\ x+z)$, find $R(T)$, $N(T)$ and hence verify Rank-Nullity theorem. **6**

b) Let T be a linear operator defined on $\mathbb{R}^3$ through $T\left(x,\ y,\ z\right)=(2x+3y-z, 4y-z,\ 2z)$. Is T invertible? If so, then find a formula for T^{-1}. **7**

c) Find the matrix of linear transformation $T:V_2(\mathbb{R})\to V_3(\mathbb{R})$ defined by $T\left(x,\ y\right)=(-x+2y,\ y,\ -3x+3y)$ relative to the basis $B_1=\left\{(1,1),\ (-1,1)\right\}$ and $B_2=\left\{(1,1,1),\ (1,-1,1),\ (0,0,1)\right\}$. **7**

UNIT- III

4 a) Find A^4 given $A=\begin{bmatrix}1 & 2 & 3\\ 2 & 4 & 5\\ 3 & 5 & 6\end{bmatrix}$ using Cayley-Hamilton theorem. **6**

b) Find the eigen space of the linear transformation $T:R^3 \to R^3$ defined by $T(x, y, z)=(3x+2y+z,\ x+4y+z,\ 2y+4z)$. **7**

c) Determine all possible Jordan canonical forms of the linear operator $T:V \to V$ whose characteristic polynomial is $\Delta(t)=(t-2)^3(t-5)^2$. **7**

OR

5 a) Find the characteristic and minimal polynomial of $A=\begin{bmatrix}3 & 2 & 0 & 0 & 0\\ 1 & 4 & 0 & 0 & 0\\ 0 & 0 & 3 & 1 & 0\\ 0 & 0 & 1 & 3 & 0\\ 0 & 0 & 0 & 0 & 4\end{bmatrix}$. **6**

b) Find eigenvalues and eigenvectors of the linear transformation $T:V_2(\mathbb{R}) \to V_2(\mathbb{R})$ defined by $T(x, y)=(2x+5y,\ 4x+3y)$. **7**

c) Express the initial-value problem $\frac{d^2x(t)}{dt^2}-2\frac{dx(t)}{dt}-3x(t)=0$ subjected to $x(0)=4,\ \frac{dx(0)}{dt}=5$ into fundamental form and hence solve. **7**

UNIT- IV

6 a) Let W be a subspace of $\mathbb{R}^5$ spanned by $u=(1,2,3,-1,2)$ and $v=(2,4,7,2,-1)$. Find a basis of the orthogonal compliment $W^\perp$ of W. **6**

b) Find an orthogonal basis and hence an orthonormal basis of U, the subspace of $\mathbb{R}^4$ spanned by the vectors $v_1=(1,1,1,1)$, $v_2=(1,1,2,4)$ and $v_3=(1,2,-4,-3)$ using Gram-Schmidt orthogonalization process. **7**

c) Obtain the QR factorization of $A=\begin{bmatrix}1 & 1 & 2\\ 0 & 0 & 1\\ 1 & 0 & 0\end{bmatrix}$. **7**

UNIT- V

7 a) Orthogonally diagonalize $\begin{bmatrix}3 & -2 & 4\\ -2 & 6 & 2\\ 4 & 2 & 3\end{bmatrix}$. **10**

b) Find a singular value decomposition of $\begin{bmatrix}1 & -1\\ -2 & 2\\ 2 & -2\end{bmatrix}$. **10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2022 Semester End Main Examinations

Programme: B.E **Semester: IV**
Branch: CS / IS / AIML **Duration: 3 hrs.**
Course Code: 19MA4BSLIA **Max Marks: 100**
Course: Linear Algebra **Date: 08.10.2022**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Solve the system of equations $-x_1 + x_3 = 5$; $2x_1 + 3x_2 - 2x_3 + 6x_4 = -1$; $-x_2 + 2x_3 = 3$ and $x_3 + 5x_4 = 7$ by LU factorization method. 6

b) Consider the set of ordered pairs $V = \{(x, y) \mid x, y \in \mathbb{R}\}$ and the field of reals. The vector addition '+' is the standard vector addition and the scalar multiplication is defined as $k \cdot (x, y) = (0, ky)$. Show that $(V, +)$ is an abelian group. Is V a vector space over the field of reals? Justify. 7

c) Find a basis and the dimension of the subspace spanned by $S = \{p_1(t), p_2(t), p_3(t), p_4(t)\}$ where $p_1(t) = t^3 + t^2 - t$, $p_2(t) = t^3 + 2t^2 + 1$, $p_3(t) = 2t^3 + 3t^2 + t + 1$ and $p_4(t) = 3t^3 + 5t^2 + t - 2$. 7

OR

2 a) Determine whether or not W is a subspace of R^3 where W consists of all vectors of the form (a, b, c) in R^3 such that 6

i. $a + b + c = 0$.
ii. $a \le b \le c$.
iii. $a + b + c = 3$.

b) Determine the coordinate vector of the matrix $\begin{bmatrix} 4 & 3 \\ 6 & 2 \end{bmatrix}$, relative to the basis 7

$$S = \left\{ \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix} \right\}$$ by Gauss elimination method.

c) Find the basis of the column space, row space and the null space of the matrix 7

$$\begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & 1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & 4 \end{bmatrix}.$$

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT- II

3 a) Find the matrix of the linear transformation $T: M_{2\times2} \to \mathbb{R}^2$ defined by $T\begin{bmatrix} a & b \\ c & d \end{bmatrix} = (a+b+3c,\ b+c-5d)$ relative to the bases $S = \left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 1 & -1 \end{bmatrix} \right\}$ and $S' = \{(1,2), (2,1)\}$. 6

b) Obtain the basis of the range space and the kernel and hence verify the Rank-Nullity theorem for the linear transformation $T: \mathbb{R}^5 \to \mathbb{R}^3$ given by $T(x,y,z,s,t) = (x+2y+2z+s+t,\ x+2y+3z+2s-t,\ 3x+6y+8z+5s-t)$. 7

c) Determine whether the linear transformation $T: \mathbb{R}^4 \to \mathbb{R}^3$ given by $T(x,y,z,s) = (x+2z-t,\ 2x+3y-z+t,\ -2x-5z+3t)$ singular or non-singular. If it is singular, then find the kernel of the linear transformation. Is the mapping onto? Justify. Is the mapping invertible? Justify. 7

UNIT- III

4 a) Apply Cayley-Hamilton theorem to obtain the inverse of the matrix $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 3 & 2 \\ 2 & 1 & 2 \end{bmatrix}$. 6

b) Find all the eigenvalues and the corresponding eigen spaces of the linear mapping $T: P_2(t) \to P_2(t)$ given by $T(at^2+bt+c) = (5a+b+2c)t^2 + 3bt + (2a+b+5c)$. 7

c) Obtain all possible Jordan canonical forms of the linear transformation whose characteristic polynomial is $\Delta(t) = (t+3)^5 (t+5)^3$ and the minimal polynomial is $m(t) = (t+5)^2 (t+3)^2$. 7

OR

5 a) Find the characteristic and minimal polynomial of the matrix 6

$$A = \begin{bmatrix} 2 & 1 & -1 & 0 & 0 & 0 \\ 0 & 2 & 1 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 1 & 0 \\ 0 & 0 & 0 & 1 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 & 2 \end{bmatrix}.$$

b) Find all eigenvalues and the corresponding eigen spaces of the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ defined by the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 4 & 0 & 2 \\ 0 & 0 & -1 \end{bmatrix}$. 7

c) Express the differential equation $\dfrac{dx}{dt} = -2x(t) + 3y(t)$; $\dfrac{dy}{dt} = -x(t) + 2y(t)$ given $x(2) = 2$ and $y(2) = 4$ in its fundamental form and hence solve. 7

UNIT- IV

6 a) Find a basis of the orthogonal complement of the subspace W spanned by $S=\{(1,2,3,-1,2),(2,4,7,2,-1)\}$. **4**

b) Obtain the least square solution of the system $x+2y+z=1$; $3x-y=2$; $2x+y-z=2$; $x+2y+2z=1$. **8**

c) Apply Gram-Schmidt process to orthogonalize the basis $S=\{1,1-t,t^2\}$ of the inner product space $P_2(t)$ given that $\langle u,v\rangle=\int_0^1 u(t)v(t)\,dt$. **8**

UNIT- V

7 a) Determine the modal matrix that reduces the quadratic form $2xy+2yz-2xz$ to a canonical form and hence discuss the nature of the quadratic form. **10**

b) Obtain the singular value decomposition of the matrix $\begin{bmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{bmatrix}$. **10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2023 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: CSE/ISE **Duration: 3 hrs.**
Course Code: 19MA4BSLIA **Max Marks: 100**
Course: Linear Algebra

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

			CO	***PO***	**Marks**
		UNIT - I			
1	a)	Solve the system of equations $x+2y+3z=14$, $4x+5y+7z=35$ and $3x+3y+4z=21$ for complete solution. Also mention the free variables and the pivot variables.	*CO1*	*PO1*	**7**
	b)	Solve the system of equations $x+y+z=1, 3x+y-3z=5$ and $x-2y-5z=10$ by LU-Decomposition method.	*CO1*	*PO1*	**7**
	c)	Find the basis and dimension for Column space and Row space of the matrix $A=\begin{bmatrix}1&2&0&1\\0&1&1&0\\1&2&0&1\end{bmatrix}$.	*CO1*	*PO1*	**6**
		OR			
2	a)	Solve the system of equations $u+3v+3w+2y=1$, $2u+6v+9w+7y=5$ and $-u-3v+3w+4y=5$ for the complete solution.	*CO1*	*PO1*	**7**
	b)	Solve the system of equations $x+y+z=9, 2x+5y+7z=52$ and $2x+y-z=0$ by Gauss elimination method.	*CO1*	*PO1*	**7**
	c)	Check linearly dependency or linearly independency of following set of vectors. i) $A=\{(1,-3,2),(2,1,-3),\ (-3,2,1)\}$ and ii) $B=\{(2,1,3),\ (1,3,2),(3,2,1)\}$.	*CO1*	*PO1*	**6**
		UNIT - II			
3	a)	Find the matrix representation of linear transformation $T: R^2 \to R^2$ defined by $T(x,y)=(2x+3y,4x-5y)$ relative to $\{(1,2),(2,5)\}$ for both vector space in domain and codomain.	*CO1*	*PO1*	**7**
	b)	If $T: R^2 \to R^3$ is defined by $T(x,y)=(x,y,x+y)$. Show that T is linear transformation and also find its kernel.	*CO1*	*PO1*	**7**
	c)	Show that the linear transformation $T: R^2 \to R^2$ defined as $T(x,y)=(3x-5y,-3x-6y)$ is invertible and find T^{-1}.	*CO1*	*PO1*	**6**

			UNIT – III			
	4	a)	Find all the eigenvalues and corresponding eigenvectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.	*CO2*	*PO1*	**7**
		b)	Diagonalize the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ and hence find A^4.	*CO2*	*PO1*	**7**
		c)	Find minimal polynomial and characteristic polynomial of the matrix $A = \begin{bmatrix} 3 & -1 & 0 \\ 0 & 2 & 0 \\ 1 & -1 & 2 \end{bmatrix}$.	*CO2*	*PO1*	**6**
			OR			
	5	a)	Compute the eigenspace of the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ defined by the matrix $A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$.	*CO2*	*PO1*	**7**
		b)	Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ also compute A^{-1} and A^4.	*CO2*	*PO1*	**7**
		c)	Write the Jordan canonical form of matrix whose characteristic and minimal polynomial are respectively $(x-1)^3(x-2)^2$ and $(x-1)^2(x-2)$.	*CO2*	*PO1*	**6**
			UNIT – IV			
	6	a)	Apply Gram-Schmidt orthogonalization to construct the orthonormal basis of the vector space spanned by the vectors $(1\ \ 0\ \ 1), (1,0,0), (2,1,0)$.	*CO3*	*PO1*	**7**
		b)	Find QR decomposition of the matrix $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.	*CO3*	*PO1*	**7**
		c)	Find the least square solution of the system of equations $-x+2y=3,\ x+y=4,\ x-2y=0$ and $3x+2y=2$.	*CO3*	*PO1*	**7**
			UNIT – IV			
	7	a)	Determine the orthogonal modal matrix and hence diagonalize the matrix $\begin{bmatrix} 1 & 5 & -2 \\ 5 & 4 & 5 \\ -2 & 5 & 1 \end{bmatrix}$.	*CO3*	*PO1*	**8**
		b)	Obtain the canonical form and hence classify the nature of the quadratic form $7x^2 + 6y^2 + 5z^2 - 4xy - 4yz$.	*CO3*	*PO1*	**4**
		c)	Find singular value decomposition of the matrix $A = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$.	*CO3*	*PO1*	**8**

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