Q.N		Marks	CO
1.	(a) Reduce the following matrix to row echelon form and find its rank. $$A = \begin{bmatrix} 0 & -8 & -6 \\ -2 & 2 & 1 \\ 2 & 2 & 2 \end{bmatrix}$$	[5]	1
	(b) For what values of λ the system of equations $3x - y + 4z = 3, \; x + 2y - 3z = -2, \; 6x + 5y + \lambda z = -3$ has a unique solution? Find that unique solution.	[15]	1
2.	Solve the following system $$3x_1 + x_2 + 2x_3 = 11$$ $$2x_1 + 3x_2 + x_3 = 11$$ $$x_1 + 2x_2 + 3x_3 = 14$$ Use the initial guess $\overline{X}^{(0)} = 0$.		
	(a) use Jacobi's method (3 iterations only).	[10]	2
	(b) Use Gauss Seidel method (3 iterations only).	[10]	2
3.	(a) Assign each letter of the alphabet (**A-Z**) to a number (**1–26**) and **space** to **0**. Encode the message **MY NAME IS VED** using the encoding matrix $\begin{bmatrix} 2 & 3 \\ 1 & 1 \end{bmatrix}$. Find the corresponding decoding matrix. Verify that this decoding matrix correctly decodes the message.	[8]	3
	(b) Show that matrix $A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}$ is diagonalizable. Find its diagonal form and transforming matrix.	[12]	5

4.	(a) Show that following vectors are linearly dependent and find relation between them. $X_1 = \begin{pmatrix} 1 & 2 & 3 \end{pmatrix}^T$, $X_2 = \begin{pmatrix} 3 & -2 & 1 \end{pmatrix}^T$, $X_3 = \begin{pmatrix} 1 & -6 & -5 \end{pmatrix}^T$	[8]	4
	(b) Show that the function T: $R^3 \rightarrow R^2$ defined by T(a, b, c) = (a, b) is a linear transformation. Also find the rank and nullity of T.	[12]	4
5.	Attempt any TWO.		
	(a) Solve the following system of differential equations using diagonalization. $$\frac{dy_1}{dt} = -3y_1 - 2y_2 + 2y_3$$ $$\frac{dy_2}{dt} = 2y_2$$ $$\frac{dy_3}{dt} = -4y_1 - y_2 + 3y_3$$	[10]	6
	(b) Given $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$. Find the matrix A^{50}.	[10]	6
	(c) Given the following link Matrix of a digraph with vertices A, B and C. $$M = \begin{matrix} & & From \\ & & A \quad B \quad C \\ To & \begin{matrix} A \\ B \\ C \end{matrix} & \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix} \end{matrix}$$ Which vertex has maximum page rank.	[10]	6

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