



Model Question Paper
B.Tech, IV SEMESTER,
LINEAR ALGEBRA
(Common for All Branches)

Sub Code: **UE18MA251**

Time: 3 Hrs

Answer All Questions

Max Marks: 100

1.	a)	Solve the system equations $u + 2v + 2w = 10, 2u + 3v - 4w = 3$ and $u + v + w = 7$ using Gaussian elimination.	7
	b)	Factorize either $A=LDU$ or $PA=LDU$ for $A = \begin{bmatrix} 1 & -2 & 2 \\ 2 & -4 & 5 \\ -2 & 5 & -4 \end{bmatrix}$.	7
	c)	Find A^{-1} using Gauss-Jordan method where $A = \begin{bmatrix} 1 & 2 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$.	6
2.	a)	Find the special solutions to $Ax=0$ where $A = \begin{bmatrix} 0 & 2 & 4 & 6 \\ 0 & 1 & 3 & 2 \\ 0 & 1 & 1 & 4 \end{bmatrix}$. Identify the pivots and the vectors perpendicular to special solutions of $Ax=0$.	7
	b)	For what value of λ will the vectors $(1, 3, -5)$, $(0, 5, \lambda)$ and $(-2, -1, 0)$ span a two dimensional subspace? For this value of λ , find the basis for $C(A)$ and $N(A^T)$ where A is the matrix with these vectors as columns.	7
	c)	Check whether the set $\{u+v, u+2v+3w, u+v-2w\}$ is linearly independent or not, if the set $\{u, v, w\}$ is linearly independent.	6
3.	a)	Determine the Kernel and range of the linear operator $T: R^3 \rightarrow R^3$ defined by the equation $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x+2y-z \\ y+z \\ x+y-2z \end{pmatrix}$. What is the dimension of the null space and column space of the matrix of the transformation T ?	7
	b)	Find the projection of b onto the column space of $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \\ -2 & 4 \end{bmatrix}$, $b = \begin{bmatrix} 1 \\ 2 \\ 7 \end{bmatrix}$. Split b into $p+q$, with p in the column space and q perpendicular to that space.	7
	c)	Find the best straight line fit (least squares) to the measurements $b = 4$ at $t = -2$, $b = 3$ at $t = -1$, $b = 1$ at $t = 0$, $b = 0$ at $t = 2$.	6

4.		Find Eigen vectors and Eigen values of $A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$.	7
	b)	Using Gram-schmidt orthogonalization process find an orthonormal set of vectors q_1, q_2, q_3 for which q_1, q_2 span the column space of $A = \begin{bmatrix} 1 & 1 \\ 2 & -1 \\ -2 & 4 \end{bmatrix}$. Factorize $A = QR$	7
	c)	Diagonalize $A = \begin{pmatrix} 2 & 3 \\ 0 & 5 \end{pmatrix}$ and hence prove that $A^k = \begin{pmatrix} 2^k & 5^k - 2^k \\ 0 & 5^k \end{pmatrix}$.	6
5.	a)	Find the 3×3 matrices A and B for $\delta_1 : x^2 + y^2 + 2xz + 4yz + 3z^2$ $\delta_2 : x^2 + 2y^2 - 4xz - 4yz + 7z^2$ By Pivots of A and B decide whether they are positive definite or not.	8
	b)	Find the SVD of $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$.	12
