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PES UNIVERSITY, BANGALORE-85

(Established under Karnataka Act 16 of 2013)

UE17MA251

END SEMESTER ASSESSMENT

Dec-2019 B.Tech, IV SEMESTER,

LINEAR ALGEBRA

(Common for All Branches)

Sub Code: **UE17MA251**

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, λ) 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 $T:R^3\to R^3$ 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

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4.	a)	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

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