SRN

PES University, Bengaluru

(Established under Karnataka Act No. 16 of 2013)

UE19MA251

IN SEMESTER ASSESSMENT (ISA) B. Tech. IV SEMESTER –MARCH 2021

TEST 1

UE19MA251 - LINEAR ALGEBRA AND ITS APPLICATIONS

Time : 2 Hours | Answer All Questions | Max Marks: 60

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1 a) Use the method of Gaussian elimination to decide if the planes y-4z=8, 2x-3y+2z=1, 5x-8y+7z=1 have a common point of intersection in ¡ ^{3}. What happens if the right hand side of the third equation is changed to -3/2 instead of the present number 1? What are all the solutions in that case? **6**

b) Compute the inverse of A= $\begin{pmatrix} 1 & 2 & 1 \\ 1 & 3 & 2 \\ 1 & 0 & 1 \end{pmatrix}$ using Gauss Jordan method . **7**

c) Factorize /PA=LU for A= $\begin{pmatrix} 0 & 2 & 2 & 2 & 2 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 3 & 3 & 1 \\ 0 & 1 & 3 & 3 & 1 \end{pmatrix}$ **7**

2 a) Find all independent vectors on the intersection of the two planes x_1-x_3+x_4=0 and x_1-2x_2-3x_4=0. These independent vectors are the null space of which matrix? What is the nullspace matrix? **6**

b) Let V be the set of all vectors of the form $\begin{pmatrix} a+2b+4c \\ b+2c \\ -a+3b+6c \end{pmatrix}$ where a,b,c are arbitrary.(i) Find vectors u_1, u_2, u_3 such that V=span(u_1, u_2, u_3) . **7**

(ii) Is V a subspace of R^3?

(iii) Find a basis and the dimension of V.

c) If the vectors (1,1,2), (1,2,4),(2,4,8) span the column space of A, determine whether or not the vector b=(2,3,5) is in C(A). What value should replace the third component "5" in the vector b so that the system Ax=b has infinitely many solutions? Express this new vector b as a linear combination of columns of A. **7**

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3	a)	For each of the following linear transformations T, find a basis and the dimension of the range and kernel of T: (i) $T : ¡^{3} \to ¡^{2}$ defined by T(x, y, z)=(x+y, y-z) (ii) $T : ¡^{2} \to ¡^{2}$ defined by T(x, y)=(x+2y, 2x-y)	6
	b)	If V is a subspace spanned by (1,1,0,1) and (0,0,1,0) find a basis for the orthogonal complement $V^{\perp}$. Find the projection matrix from b to V and also the vector in V closest to the vector b=(0,1,0,-1) in $V^{\perp}$.	7
	c)	Project b=(1,0,0) onto the lines through a_1=(-1,2,2), a_2=(2,2,-1) and a_3=(2,-1,2). Find the projection matrix P from b onto the column space of A. Also find the solution to Ax=b and show that projection vector p=b.	7