PES University, Bengaluru

(Established under Karnataka Act 16 of 2013)

END SEMESTER ASSESSMENT (ESA) - DEC 2023

UE20MA251 - Linear Algebra and Its Applications

Total Marks : 100.0

1.a. Apply Gaussian elimination to find the solution of the system

X+2y-3z+4t = 2, y+4z-7t = -3, 2y+8z-14t = -7 (5.0 Marks)

1.b. Find a & b values if the system has trivial solution, unique solution, no solution and infinitely many solutions.

X+y+az = 2b, x+3y+(2+2a) z = 7b, 3x+y+(3+3a) z = 11b (10.0 Marks)

(5.0 Marks)

1.c. Factorize $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ into LDU decomposition.

2.a. Find the basis of C(A), N(A), $C(A^T)$, $N(A^T)$ if X+2y+t = 0, y+z = 0, x+2y+t = 0 (10.0 Marks)

2.b. Solve the system by using null space and column space solutions X+2y+3z+5t = 0, 2x+4y+8z+12t = 6, 3x+6y+7z+13t= -6 (10.0 Marks)

3.a. Explain the transformations with appropriate diagrams :: linear transformation, Rotation transformation, shear transformation, projection transformation, reflection transformation. (10.0 Marks)

3.b. Find the matrix of the transformation T(x,y,z) = (2y+z, x-4y, 3x) with respect to the
Basis ={ (1,1,1), (1,1,0) (1,0,0)} . (10.0 Marks)

4.a. Find the orthonormal basis using Gram Schmidt process if the given vectors are
a=(1,0,1) b=(1,0,0) c=(2,1,0) (10.0 Marks)

4.b. Find the eigen values and eigen vectors of the matrix and diagonalize the matrix $A = \begin{bmatrix} 2 & 4 & 3 \\ -4 & -6 & -3 \\ 3 & 3 & 1 \end{bmatrix}$ (10.0 Marks)

5.a. Verify for the positive definiteness of the matrix A = $\begin{bmatrix} 5 & 2 & 1 \\ 2 & 2 & 2 \\ 1 & 2 & 5 \end{bmatrix}$

(10.0 Marks)

5.b. Find the singular value decomposition of the matrix A = $\begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}$

(10.0 Marks)