Reg. No.																

Question Paper Code	12775

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Second Semester

Computer Science and Business Systems

20BSMA202 - LINEAR ALGEBRA

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

	Question	Marks	K – Level	CO
1.	Write the augmented matrix$[A/I_3]$.	2	K2	CO1
2.	Find the determinant of A if $A=\begin{bmatrix}2 & 3\\1 & -1\end{bmatrix}$.	2	K2	CO1
3.	Define linear combination.	2	K1	CO2
4.	Solve $3x + 2y = 4$, $2x – 3y = 7$ by Gauss elimination method.	2	K2	CO2
5.	Prove that the union of two subspaces of a vector space need not be a subspace.	2	K2	CO3
6.	What is the Dimension of $M2_{*2}(R)$?	2	K2	CO3
7.	Define Linear Transformation.	2	K1	CO4
8.	Write any two properties of Hermitian matrix.	2	K1	CO4
9.	State Singular value decomposition theorem.	2	K1	CO5
10.	Give any two applications of Image Processing.	2	K1	CO5

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

		Question	Marks	K – Level	CO
11.	a)	Solve the following equations by using cramer's rule $x+y+z = 6$, $2x+3y-z =5$, $6x-2y-3z = -7$.	16	K3	CO1
		OR			
	b) i)	Find the Rank of the following matrix $A = \begin{bmatrix}1 & -3 & 2\\4 & 4 & -1\\6 & 3 & 5\end{bmatrix}$.	8	K3	CO1
	ii)	Solve the given system of equations using inverse of a matrix $x+2y+2z = -5$, $3x-2y+z = -6$, $2x+y-z = -1$.	8	K3	CO1
12.	a) i)	Find the Rank of the following matrix $A = \begin{bmatrix}1 & -3 & 2\\4 & 4 & -1\\6 & 3 & 5\end{bmatrix}$.	8	K3	CO2
	ii)	Solve by Gauss elimination for the following system $x+3y+3z = 16$, $x+4y+3z = 18$, $x+3y+4z = 19$.	8	K3	CO2

OR

b) Solve the linear system 6x+18y+3z = 3, 2x+12y+6=19, 4x+15y+3z = 19 by LU decomposition method. *16* *K3* *CO2*

13\. a) Applying Gram-Schmidt processes find the orthonormal basis of $V_3(R)$ with the standard inner product starting with the following bases. *16* *K3* *CO3*
(i) (1,0,1) , (1,0,-1) , (0,3,4).
(ii) (1,0,1) , (1,3,1) , (3,2,1).

OR

b) i) Prove that S = { (1,0,0) , (0,1,0) , (1,1,1)} is basis for $V_3(R)$. *8* *K3* *CO3*

ii) Find the QR decomposition of a matrix $A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ *8* *K3* *CO3*

14\. a) If $T: R^2 \to R^3$ is a linear transformation such that T(1,1)=(1,0,2), T(2,3)=(1,-1,4). Determine *16* *K3* *CO4*
(i) T
(ii) T(2,5),T(8,11)
(iii) Rank T.

OR

b) i) Show that $T: V_2(R) \longrightarrow V_2(R)$ defined by $T(a,b) = (2a - 3b, a + 4b)$ is a linear transformation. *8* *K3* *CO4*

ii) Find the matrix of T in the standard basis for the transformation $T: P_2(R) \to P_2(R)$ where $T(f(x)) = f'(x)$. *8* *K3* *CO4*

15\. a) Find the singular value decomposition of $\begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ *16* *K3* *CO5*

OR

b) i) Explain Applications in Machine Learning. *8* *K2* *CO5*

ii) Given the following data, use principal component analysis to reduce the dimension from 2 to 1. *8* *K3* *CO5*

Feature	Ex.1	Ex.2	Ex.3	Ex.4
x	4	8	13	7
y	8	4	5	14