MSc (SS) DEGREE EXAMINATION MAY 2026
(Second Semester)

Branch – **SOFTWARE SYSTEMS (FIVE YEARS INTEGRATED)**

APPLIED LINEAR ALGEBRA

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	A square matrix with 1's on the main diagonal and zero elsewhere is called an __________. (i) zero matrix (ii) null matrix (iii) diagonal matrix (iv) identity matrix	K1	CO1
	2	If A is a square matrix, the sum of the entries on the main diagonal is defined as ____________. (i) transpose of A (ii) trace of A (iii) idempotent (iv) transition of A	K2	CO1
2	3	A finite set that contains __________ is linearly dependent. (i) zero (ii) one (iii) two (iv) three	K1	CO2
	4	All bases for a _______ dimensional space have the same number of vectors. (i) finite (ii) infinite (iii) n (iv) none of the above	K2	CO2
3	5	A square matrix is invertible if and only if λ ______ is not a eigen value of A. (i) equal to zero (ii) not equal to zero (iii) equal to one (iv) not equal to one	K1	CO3
	6	Cauchy Schwarz inequality $\lvert\langle u,v\rangle\rvert \le$ __________. (i) $\lVert u\rVert$ (ii) $\lVert v\rVert$ (iii) $\lVert 1\rVert$ (iv) $\lVert u\rVert\,\lVert v\rVert$	K2	CO3
4	7	Triangle inequality for vector u,v is $\lVert u+v\rVert \le$ __________ (i) $\lVert u\rVert + \lVert v\rVert$ (ii) $\lVert u\rVert$ (iii) $\lVert u\ \rVert$ (iv) $\lVert u\rVert / v\rVert$	K1	CO4
	8	In every eigen Value of A the geomertic multiplicity is ____ algebraic multiplicity. (i) less than (ii) less than or equal to (iii) greater than (iv) equal to	K2	CO4
5	9	If T: V→ W is a lintear transformation then T(0) = ______. (i) 1 (ii) 0 (iii) 2 (iv) -1	K1	CO5
	10	If I: V→ V is defined by I(v) =v is called an _____ operator. (i) Identity (ii) Inverse (iii) Transverse (iv) null	K2	CO5

SECTION - B (35 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find p(A) for p(x) = x^2-2x-3 and matrix $A = \begin{bmatrix} -1 & 2 \\ 0 & 3 \end{bmatrix}$	K2	CO1
		(OR)		
	11.b.	Determine whether the given matrix A is elementary matrix, $Where\ A = \begin{bmatrix} 1 & 0 \\ 0 & -3 \end{bmatrix}$		
2	12.a.	If u = (1,2,-1) and v = (6,4,2), Show that w = (9,2,7) is a linear combination of u and v.	K2	CO2
		(OR)		

Cont...

3	13.a.	Confirm by multiplication that x is an eigen value of A and find the eigen value where $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$, $x = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$	K2	CO3
		(OR)		
	13.b.	Show that A and B are similar matrices, where $A = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 \\ 3 & -2 \end{bmatrix}$		
4	14.a.	Find a matrix that generates the stated weighted inner product on two dimensional space (u,v) = $=2u_1v_1+3u_2v_2$	K3	CO4
		(OR)		
	14.b.	Show that the vectors u and v are orthogonal where $u = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ $V = \begin{bmatrix} 0 & 2 \\ 0 & 0 \end{bmatrix}$		
5	15.a.	Let T be a transformation defined by T[p(x)] = xp(x), Find the matrix for T relative to the basis $B_1 =[1, x, x^2]$ and $B_2 = [1, x, x^2, x^3]$.	K3	CO5
		(OR)		
	15.b.	Determine whether the mapping T is a linear transformation and find its kernel where $T\begin{bmatrix} a & b \\ c & d \end{bmatrix} = a^2 + b^2$.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Verify (AB)C =A(BC) for $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 0 & 1 \end{pmatrix}$ $B = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix}$	K2	CO1
2	17	Extend the product Ax=b as a linear combination of column vectors where $A = \begin{bmatrix} -1 & 3 & 2 \\ 1 & 2 & -3 \\ 2 & 1 & -2 \end{bmatrix}$ $x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$, $b = \begin{pmatrix} 1 \\ -9 \\ -3 \end{pmatrix}$	K2	CO2
3	18	Find the characteristic equation, eigen value for $\begin{pmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{pmatrix}$	K3	CO3
4	19	Find the least square solution of the equation Ax=b, Where $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \\ 4 & 5 \end{pmatrix}$ $x = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$, $b = \begin{pmatrix} 2 \\ 7 \\ 5 \end{pmatrix}$	K3	CO4
5	20	Let T be a transformation $T\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} x_1 + x_2 \\ -x_1 \end{pmatrix}$. Find $T_{B^1, B}$ relative to B = (u1 , u2,) B' = (v1,v2,v3) Where $v_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ $v_2 = \begin{bmatrix} 2 \\ 2 \\ 0 \end{bmatrix}$ $v_3 = \begin{bmatrix} 3 \\ 0 \\ 0 \end{bmatrix}$	K3	CO5

Z-Z-Z END