A 03GAMAT201052503 Pages: 3

Reg No.:_______________ Name:___________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S2 (R) Exam May 2025 (2024 Scheme)

Course Code: GAMAT201

Course Name: MATHEMATICS FOR INFORMATION SCIENCE-2

Max. Marks: 60 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks)

		CO	Marks
1	Find the rank of the matrix $\begin{bmatrix}1 & -1 & 0\\1 & 3 & -1\\5 & 3 & -2\end{bmatrix}$	CO1	(3)
2	Find the spectrum of $\begin{bmatrix}0 & 4\\-4 & 0\end{bmatrix}$	CO1	(3)
3	Show that W = $\{(x_1, x_2): x_1 \geq 0 \; and \; x_2 \geq 0\}$ with standard operations, is not a subspace of R^2.	CO2	(3)
4	Check whether the set {(1,2,3), (1,1,4)} is linearly independent in R^3	CO2	(3)
5	Find the angle between two vectors u and v if u= (1,1,1) and v = (2,1,-1).	CO3	(3)
6	Find the norm of u+v, if u = (3,1,3) and v = (0,-1,1).	CO3	(3)
7	Find the rank and nullity of T:$R^3 \rightarrow R^3$ defined by T(x) = Ax A=$\begin{bmatrix}1 & 2 & 0\\0 & 1 & 1\\0 & 0 & 1\end{bmatrix}$.	CO4	(3)
8	Let T:$R^3 \rightarrow R^3$ be a linear transformation such that T(1,0,0) = (2,-1,4), T(0,1,0) = (1,5,-2) , T(0,0,1) = (0,3,1) Find T(2,3,-2).	CO4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module -1

9	a)	Find the values of α and β for which the system of equations 2x+3y+5z = 9,7x+3y-2z=8, 2x+3y+αz=β has (i)no solution (ii)unique solution (iii) infinite number of solutions.	CO1	(5)
	b)	Find the eigen vectors of $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$	CO1	(4)
10	a)	Diagonalize $\begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$	CO1	(5)
	b)	Solve the system of equations 2x-y+3z = 8, -x+2y+z = 4, 3x+y-4z = 0.	CO1	(4)

Module -2

11	a)	Find the coordinate matrix of x = (1,2,-1) in R^3 relative to the nonstandard basis B'={(1,0,1), (0,-1,2), (2,3,-5)}.	CO2	(5)
	b)	Determine whether the set S={(4,7,3),(-1,2,6),(2,-3,5)}spans R^3.	CO2	(4)
12	a)	Given B={(-3,2),(4,-2)} and B' ={(-1,2),(2,-2)}are two bases of R^2, find the transition matrix from B' to B.	CO2	(5)
	b)	Write the vector (1,1,1) as a linear combination of vectors in the set {(1,2,3),(0,1,2),(-1,0,1)}, if possible.	CO2	(4)

Module -3

13	a)	Find the Least Squares regression line for the data points (-1,1), (1,0),(3,-3).	CO3	(5)
	b)	Use Euclidean inner product in R^3 to find the orthogonal projection of u=(6,2,4) onto v = (1,2,0).	CO3	(4)
14	a)	Apply Gram-Schmidt orthonormalization process to transform the given basis B= {(1,1),(0,1)} into an orthonormal basis.	CO3	(5)

	b)	Verify the Cauchy-Schwarz inequality for A= $\begin{bmatrix} 0 & 3 \\ 2 & 1 \end{bmatrix}$ B= $\begin{bmatrix} -3 & 1 \\ 4 & 3 \end{bmatrix}$ with inner product $\langle A, B \rangle = a_{11}b_{11} + a_{12}b_{12} + a_{21}b_{21} + a_{22}b_{22}$.	CO3	(4)

Module -4

15	a)	Show that T(v_1, v_2)= (v_1-v_2, v_1+2v_2) is a linear transformation from R^2 to R^2	CO4	(5)
	b)	Find the Kernel of linear transformation T:$R^3 \to R^2$ defined by T(x) = Ax where A = $\begin{bmatrix} 1 & -1 & -2 \\ -1 & 2 & 3 \end{bmatrix}$.	CO4	(4)
16	a)	Find the standard matrix for the linear transformation T(x,y,z) = (x+y, x-y, z-x).	CO4	(5)
	b)	Let T:$R^2 \to R^2$ be a linear transformation defined by $T(x_1, x_2) = (x_1 + x_2, 2x_1 - x_2)$ Find the matrix for T relative to the bases B= {(1,2), (-1,1)} and B'={(1,0),(0,1)}.	CO4	(4)

****