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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech S2 (S) / S1 (Challenge Course) Examination December 2025 / January 2026 (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 eigen values of $\begin{bmatrix} 3 & -2 \\ 9 & -6 \end{bmatrix}$	CO1	(3)
2	Find the rank of the matrix $\begin{bmatrix} 3 & 2 & 1 \\ 2 & 1 & 1 \\ 6 & 2 & 4 \end{bmatrix}$	CO1	(3)
3	Determine whether the subset w = {(x, x+y, y): x and y are real numbers} is a subspace of R^3.	CO2	(3)
4	Show that the set {(1,1), (1,-1)} is a basis for R^2.	CO2	(3)
5	Find the unit vector in the direction of (3,-1,2) and verify that the unit vector has length 1.	CO3	(3)
6	Find the distance between u and v, if u = (1,2,0,-3) and v = (3,-2,4,2)	CO3	(3)
7	Let T:$R^5 \rightarrow R^7$ be a linear transformation. Find the dimension of the kernel of T when the dimension of the range is 2.	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 for which the following system is consistent x+y+z=1, x+2y+3z= α, x+5y+9z=α^2	CO1	(5)
	b)	Find the eigen vectors of $\begin{bmatrix} 3/2 & 0 \\ 0 & 3 \end{bmatrix}$	CO1	(4)

10	a)	Solve the system of equations x+2y+z = 3, 2x+3y+2z = 5, 3x-5y+5z = 2, 3x+9y-z = 4 using Gauss elimination method.	CO1	(5)
	b)	Find the matrix of the transformation that diagonalize the matrix A= $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$. Also write the diagonal matrix.	CO1	(4)

Module -2

11	a)	Check whether set of all points on the plane x+y-2z= 0 is a subspace under standard operation.	CO2	(5)
	b)	Determine whether the set {(0, 0), (1, -1)} is linearly independent or not.	CO2	(4)
12	a)	Given B = {(1, 3), (-2, -2)} and B' = {(-12, 0), (-4, 4)} are two bases of R^2, find the transition matrix from B' to B.	CO2	(5)
	b)	Determine whether the set S={(2, 1), (-1, 2)} spans R^2.	CO2	(4)

Module -3

13	a)	Find the Least Squares regression line for the data points (-2,1), (-1,2), (0,1), (1,2), (2,1).	CO3	(5)
	b)	Determine all the vectors v that are orthogonal to u, if u = (0,5).	CO3	(4)
14	a)	Apply Gram-Schmidt orthonormalization process to transform the given bases B= {(3,4), (1,0)} into an orthonormal basis.	CO3	(5)
	b)	Verify the Cauchy-Schwarz inequality for A= $\begin{bmatrix} 1 & -1 \\ 2 & 0 \end{bmatrix}$ B= $\begin{bmatrix} 1 & 1 \\ 0 & 3 \end{bmatrix}$ 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)	Determine whether the transformation T:$R^2 \rightarrow R^2$ defined by T(x,y) = (x-y, x+3y) is linear. If it is, find the standard matrix of T.	CO4	(5)
	b)	Find the kernel and range of T, T:$R^2 \rightarrow R^2$ by T(x) = Ax if A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.	CO4	(4)
16	a)	Find the rank and nullity of $\begin{bmatrix} 1 & 0 & -2 \\ 0 & 1 & -1 \\ 2 & 2 & -6 \end{bmatrix}$.	CO4	(5)
	b)	Let T:$R^2 \rightarrow R^2$ 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)

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