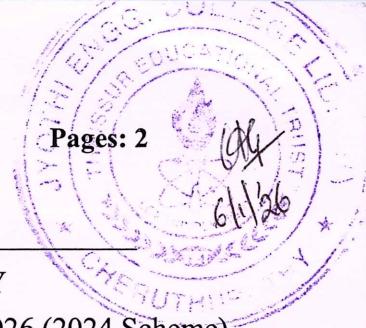


Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

## 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 $w = \{(x, x+y, y) : x \text{ and } y \text{ are real numbers}\}$ 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  $\alpha$  for which the following system is consistent  $x+y+z=1$ ,  $x+2y+3z=\alpha$ ,  $x+5y+9z=\alpha^2$  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  $x+2y+z = 3$ ,  $2x+3y+2z = 5$ ,  $3x-5y+5z = 2$ , CO1 (5)  
 $3x+9y-z = 4$  using Gauss elimination method.

b) Find the matrix of the transformation that diagonalize the matrix  $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ . CO1 (4)

Also write the diagonal matrix.

### Module -2

11 a) Check whether set of all points on the plane  $x+y-2z=0$  is a subspace under CO2 (5)  
standard operation.

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 CO2 (5)  
 $R^2$ , find the transition matrix from  $B'$  to  $B$ .

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 CO3 (5)  
bases  $B = \{(3, 4), (1, 0)\}$  into an orthonormal basis.

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 CO3 (4)  
inner product  $\langle A, B \rangle = a_{11}b_{11} + a_{12}b_{12} + a_{21}b_{21} + a_{22}b_{22}$ .

### Module -4

15 a) Determine whether the transformation  $T: R^2 \rightarrow R^2$  defined by CO4 (5)  
 $T(x, y) = (x-y, x+3y)$  is linear. If it is, find the standard matrix of  $T$ .

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 CO4 (4)  
 $T(x_1, x_2) = (x_1 + x_2, 2x_1 - x_2)$  Find the matrix for  $T$  relative to the bases  
 $B = \{(1, 2), (-1, 1)\}$  and  $B' = \{(1, 0), (0, 1)\}$ .

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