Reg. No.: ……..

Name:……...

U8438

University of Kerala

First Semester Degree Examination, November 2024

Four Year Under Graduate Programme

Discipline Specific Core Course

MATHEMATICS

UK1DSCMAT110 - MATRICES AND LINEAR EQUATION

Academic Level: 100-199

Time:2Hours **Max.Marks:56**

Part A.

AnswerAllQuestions, ObjectiveType. 1MarkEach.

(CognitiveLevel: Remember/Understand) 6Marks.Time: 5Minutes

Qn. No.	Question	Cognitive Level	Course Outcome(CO)
1.	Define Trace of a Matrix	Remember	CO1
2.	Describe a Diagonal Matrix	Remember	CO2
3.	Compute $\begin{bmatrix}1 & 0\\0 & -1\end{bmatrix}^{1000}$	Understand	CO1
4.	If A =$\begin{bmatrix} sin\theta & cos\theta\\ -cos\theta & sin\theta\end{bmatrix}$ Find det(A)	Understand	CO2
5.	Define Unit Vector	Remember	CO3
6.	Define Norm of a vector	Remember	CO3

PartB.

AnswerAllQuestions, Two-Three sentences. 2MarksEach.

(CognitiveLevel:Remember/Understand/Apply) 10Marks. Time: 20Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
7.	List all the elementary row operations on a matrix.	Remember	CO1
8.	Calculate the dot product of the vectors u = (-1 ,3 ,5 ,7) and v= (-3 ,-4 ,1, 0)	Remember	CO2

9.	Consider the Matrices A = $\begin{bmatrix} -1 & 0 \\ 2 & 3 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$ Verify that AB = BA	Remember	CO2
10.	Find the distance D between the point (1, 3 ,5 ,7) and the plane 2x -3y + 6z = -1	Understand	CO3
11.	Solve the system of Linear Equation x-y = 1 2x+y = 6	Apply	CO4

Part C.
Answer all 4questions, choosing among options within each question.
Short Answer. 4Marks Each.
(CognitiveLevel:Remember/Understand/Apply/Analyse)
16 Marks.Time: 35 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
12.	**A**.Find the column - row expansion of the product AB where A = $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$ and B = $\begin{bmatrix} 2 & 0 & 4 \\ -3 & 5 & 1 \end{bmatrix}$ **OR** **B**.Find the reduced row echelon form A = $\begin{bmatrix} 1 & -3 & 7 & 2 & 5 \\ 0 & 1 & 2 & -4 & 1 \\ 0 & 0 & 1 & 6 & 9 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$	Understand	CO1
13.	**A**.If B and C are both inverse of the matrix A then show that B = C **OR** **B**.Determine whether the given homogeneous system has nontrivial solution $x_1 + 6x_2 + 4x_3 = 0$ $2x_1 + 4x_2 - x_3 = 0$ $-x_1 + 2x_2 + 5x_3 = 0$	Understand	CO2
14.	**A**.Find P (A) for P(x) = x^2 - 2x -3 and A = $\begin{bmatrix} -1 & 2 \\ 0 & 3 \end{bmatrix}$ **OR** **B**.Find the determinant of the matrix A = $\begin{bmatrix} 3 & 1 & 0 \\ -2 & -4 & 3 \\ 5 & 4 & -2 \end{bmatrix}$ by cofactor expansion along the first row	Analyse	CO3
15.	**A**.Let u = (2 ,-1 ,3) and a = (4 ,-1 ,2) Find the vector component of u along a and the vector component of u orthogonal to a **OR** **B**. Show that u = (-2 ,3 , 1, 4) and v = (1 ,2 ,0 ,-1) are orthogonal vector in R^4	Apply	CO4

PartD.
Answer all 4questions, choosing among options within each question.
Long Answer. 6Marks Each.
(CognitiveLevel:Understand/Apply/Analyse/Evaluate/Create)
24Marks. Time: 60Minutes

Qn. No.	Question	Cognitive Level	Course Outcome(CO)
16	**A**.Solve by Gauss – Jordan Elimination. $x_1 + 3x_2 - 2x_3 + 2x_5 = 0$ $2x_1 + 6x_2 - 5x_3 - 2x_4 + 4x_5 - 3x_6 = -1$ $5x_3 + 10x_4 + 15x_6 = 5$ $2x_1 + 6x_2 + 8x_4 + 4x_5 + 18x_6 = 6$ **OR** **B**.If A is Invertible and n is a non negative integer then prove that a) A^{-1} is invertible and $(A^{-1})^{-1} = A$ b) A^n is invertible and $(A^n)^{-1} = A^{-n} = (A^{-1})^n$	Understand	CO1
17.	**A**.Determine the values of a for which the system $x + 2y - 2z = 4,$ $3x - y + 5z = 2,$ $4x + y + (a^2 - 14)z = a + 2$ has i) no solutions, ii) exactly one solution iii) infinitely many solutions. **OR** **B**.Using row operation to find A^{-1} where A = $\begin{bmatrix}1 & 2 & 3\\2 & 5 & 3\\1 & 0 & 8\end{bmatrix}$	Understand	CO2
18.	**A**.Use Cramer's rule to solve the system of equation . $x_1 + 2x_3 = 6$ $-3x_1 + 4x_2 + 6x_3 = 30$ $-x_1 - 2x_2 + 3x_3 = 8$ **OR** **B**.Evaluate det (A) where A = $\begin{bmatrix}3 & 5 & -2 & 6\\1 & 2 & -1 & 1\\2 & 4 & 1 & 5\\3 & 7 & 5 & 3\end{bmatrix}$	Analyse	CO3
19.	**A**.Prove that the absolute value of the determinant det$\begin{bmatrix}u_1 & u_2\\v_1 & v_2\end{bmatrix}$ is equal to the area of the parallelogram in 2-space determine by the vectors u = (u_1 ,u_2) and v = (v_1 , v_2) **OR** **B**.a) Find the area of the triangle determine by the point P_1(2 , 2 ,0) P_2(-1 , 0 ,2) and P_3(0 ,4 , 3) b)Calculate the scalar triple product u.(v x w) of the vector u = 3i- 2j- 5k v = i+ 4j - 4k and w = 3j + 2k	Apply	CO4