



Reg. No.:

Name:.....



U8360

University of Kerala

First Semester Degree Examination, November 2024

Four Year Under Graduate Programme

Discipline Specific Core Course

MATHEMATICS

UK1DSCMAT106 - NUMBER THEORY AND LINEAR SYSTEM OF EQUATIONS

Academic Level: 100-199

Time:2 Hours

Max.Marks:56

Part A.

Answer All Questions, Objective Type. 1 Mark Each.

(Cognitive Level: Remember/Understand)

6 Marks. Time: 5 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
1.	Find the greatest common division of 13 and 17	Remember	CO 1
2.	Define prime and composite numbers.	Remember	CO 1
3.	If $\lambda = 1, 3$ are the eigenvalues of a 2×2 square matrix then identify the eigen values of A^T ?	Understand	CO 4
4.	State symmetric property of congruence relation	Understand	CO 2
5.	Define the rank of a matrix.	Remember	CO 3
6.	Define a symmetric matrix	Remember	CO 4

Part B.

Answer All Questions , Two-Three sentences. 2 Marks Each.

(Cognitive Level: Remember/Understand/Apply)

10 Marks. Time: 20 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
7.	State pigeonhole principle?	Remember	CO 1
8.	Define the fundamental theorem of arithmetic	Remember	CO 2
9.	Define the eigen values of the matrix	Remember	CO 4
10.	Identify gcd (25,35)	Understand	CO 1
11.	Solve rank of matrix $\begin{bmatrix} -2 & 4 \\ 5 & 1 \end{bmatrix}$	Apply	CO 3

Part C.

Answer all 4 questions, choosing among options within each question.

Short Answer. 4 Marks Each.

(Cognitive Level: Remember/Understand/Apply/Analyse)

16 Marks. Time: 35 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
12.	A) Explain the principle of inclusion-exclusion, Find the number of positive integers less than or equal to 2000 and divisible by 3,5 or 7 OR B) Prove that if the square of an integer is odd, then the integer must be odd and if the square of an integer is even, then the integer must be even	Understand	CO 1
13.	A) Describe the fundamental theorem of arithmetic. OR B) Prove that $n(n+1)(2n+1)$ is divisible by 6	Understand	CO 1
14.	A) Calculate rank of matrix $\begin{pmatrix} 3 & 2 & 1 \\ 1 & 4 & 2 \\ 0 & 0 & 4 \end{pmatrix}$ OR B) Solve the system of equations $2x - 6y = -2$, $-3x + 8y = 14$ using Cramer's Rule.	Analyse	CO 3
15.	A) Calculate the eigen values of matrix $\begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ OR B) Define an orthogonal matrix. For a square matrix A, show that the eigen values of A and A^T are same.	Apply	CO 4

Part D.

Answer all 4 questions, choosing among options within each question.

Long Answer. 6 Marks Each.

(Cognitive Level: Understand/Apply/Analyse/Evaluate/Create)

24 Marks. Time: 60 Minutes

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
16.	A. Demonstrate $1+2+3+\dots+n = n(n+1)/2$ for every positive integer n using mathematical induction. OR B. Explain Euclidean algorithm and find the gcd(4076,2024)	Understand	CO 1
17.	A. Describe the equation $[a,b] = ab/(a,b)$, where a, b are positive integers. OR B. Estimate the remainder when 3^{181} is divided by 17	Understand	CO 2

18.	A. Solve the system of equations $\begin{aligned}x_1 + x_2 + x_3 &= 0 \\ -x_1 + x_2 - x_3 &= 0 \\ 10x_2 + 25x_3 &= 90 \\ 20x_1 + 10x_2 &= 80\end{aligned}$ OR B. Solve the system of equations using the Gauss Elimination Method $x + 2y + 3z = 6; 2x - 3y + 4z = 3; 3x - 4y + 6z = 5$	Analyse	CO 3
19.	A. Calculate the eigen values and eigen vectors of matrix $A = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 1 & 6 \\ -1 & -2 & 0 \end{bmatrix}$ OR B. Diagonalise the matrix $A \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.	Apply	CO 4