

Reg. No.:



W7465

Name:

University of Kerala

First Semester FYUGP Degree Examination, December 2025

Discipline Specific Core Course

MATHEMATICS

UK1DSCMAT100 - Foundations of Mathematics

Academic Level: 100-199

2024-Admission

Time: 2 Hours(120 Mins)

Max. Marks: 56

**Part A.6 Marks:Time 5 Minutes.(Cognitive Level :Remember(RE)/Understand(UN)) Objective Type.1 mark each,
Answer all questions**

Qn No.	Question	CL	CO
1	State Rouche's theorem	RE	2
2	State Well-Ordering Principle.	RE	3
3	State true or false: If $a b$ and $b c$, then $c a$.	UN	3
4	Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 3, 5, 7, 9\}$. Find $A \cap B$.	UN	1
5	Find transpose of A if $A = \begin{bmatrix} 1 & 2 \\ 4 & 5 \\ 7 & 8 \end{bmatrix}$.	UN	1
6	Find the greatest common divisor (12,24,28)	UN	2

Part B.10 Marks.Time:20 Minutes (Cognitive Level:Understand(UN)/Apply(AP))Two-three sentences.2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Prove that every integer $n \geq 2$ has a prime factor.	UN	1
8	Show that for any square matrix A, $\frac{1}{2}(A - A^T)$ is always skew symmetric, where A^T is the transpose of A.	UN	1
9	Define an elementary matrix and obtain any one matrix equivalent to $A = \begin{bmatrix} 1 & 2 \\ 1 & 4 \end{bmatrix}$ by pre multiplying A with an elementary matrix.	AP	1
10	Let $U = \{1, 2, \dots, 9\}$ be the universal set and $A = \{1, 2, 3, 4, 5\}$ and $B = \{4, 5, 6, 7\}$, find	AP	1

Qn No.	Question	CL	CO
	(a) $A^C \cap B$ (b) the difference $B \setminus A$.		
11	Find $[a, b]$ if $ab = 156$ and a and b are relatively prime.	AP	3

Part C.16 Marks. Time: 35 Minutes. (Cognitive Level : Apply (AP) / Analyse (AN)) Short Answer. 4 marks each, Answer all 4 questions, choosing among options * within each question

Qn No.	Question	CL	CO
12	A) $x + 2y - z = 3$ Test for consistency $3x - y + 2z = 1$ $x - y - z = -1$ OR B) Find the inverse of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 4 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.	AP	2, 1
13	A) Using canonical decomposition of 1050 and 2574, find their lcm. OR B) Find the number of trailing zeroes in $234!$.	AP	3, 3
14	A) Prove that $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3.$ OR B) If $\begin{vmatrix} a & a^2 & a^3 - 1 \\ b & b^2 & b^3 - 1 \\ c & c^2 & c^3 - 1 \end{vmatrix} = 0$ in which a, b, c are different. Show that $abc = 1$.	AN	3, 1

Qn No.	Question	CL	CO
15	A) Prove that there are infinitely many primes. OR B) A. Test the consistency of the system of equations $5x + 3y + 7z = 4$ $3x + 26y + 2z = 9$ $7x + 2y + 10z = 5$	AN	2, 2

Part D.24 Marks.Time: 60 Minutes.(Cognitive Level :Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer 6 Marks each.Answer all 4 questions choosing among options * within each question

Qn No.	Question	CL	CO
16	A) Using Euclidean Algorithm express (4147, 10672) as a linear combination. OR B) If A and B are two sets (i) Prove that $B \setminus A = B \cap A^c$ (ii) Show that the following conditions are equivalent (a) $A \subseteq B$ (b) $A \cap B = A$ (c) $A \cup B = B$	AN	3, 1
17	A) Using Cramer's rule solve the system of equations $3x + y + 2z = 3$ $2x - 3y - z = -3$ $x + 2y + z = 4$ OR B) Find the values of a and b for which the equations	EV	2, 2

Qn No.	Question	CL	CO
	$x + ay + z = 3$ $x + 2y + 2z = b$ $x + 5y + 3z = 9$ are consistent. When will these equations have a unique solution?		
18	A) Find the number of positive integers ≤ 3000 and divisible by 3, 5, or 7. OR B) a) Find the remainder when 3^{247} is divided by 17. b) Find the positive integers n for which $\sum_{k=1}^n k!$ is a square.	EV	3, 3
19	A) Let R be the relation on N defined by $x + 3y = 12$ (i) Write R as ordered pairs (ii) find R^{-1} (iii) Find the domain and range (iv) Is R antisymmetric? (v) Is R is an equivalence Relation? OR B) Consider Z, set of all integers and an integer $m > 1$. Let R be a relation on $Z \times Z$ defined by xRy if $x - y$ is divisible by m. Show that R defines an equivalence relation on Z..	CR	3, 1