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| **University of Kerala** | | |
| Discipline: **Mathematics** |  | Time: 2 Hours (120 Mins.) |
| Course Code: **UK1DSCMAT106** |  | Total Marks: 56 |
| Course Title: Number Theory and Linear System of Equations |  |  |
| Type of Course: DSC |  |  |
| Semester: 1 |  |  |
| Academic Level: 100-199 |  |  |
| Total Credit: 4, Theory: 4 Credit, Practical: 0 Credit |  |  |

**Part A. 6 Marks**. Time: 5 Minutes

Objective Type. 1 Mark Each. Answer All Questions

(Cognitive Level: Remember/Understand)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 1. | State Pigeonhole Principle | Remember | CO1 |
| 2. | Define the congruence relation | Remember | CO2 |
| 3. | Write two relatively prime integers. | Understand | CO1 |
| 4. | Transpose of is ………… | Understand | C03 |
| 5. | Define linear dependence of vectors. | Remember | CO3 |
| 6. | Define eigen values of a square matrix. | Remember | CO4 |

**Part B. 10 Marks**. Time: 20 Minutes

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

(Cognitive Level: Remember/Understand/Apply)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 7. | State the Inclusion-Exclusion Principle | Remember | CO1 |
| 8. | Define rank and find the rank of | Remember | CO3 |
| 9. | Define symmetric and orthogonal matrices. | Remember | CO4 |
| 10. | If and , show that | Understand | CO2 |
| 11. | Using Euclidean Algorithm, find gcd(4076,1024) | Apply | CO1 |

**Part C. 16 Marks**. Time: 35 Minutes

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

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

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| Qn.  No. | Question | Cognitive  Level | Course  Outcome (CO) |
| 12. | A. Express *(*28*,* 12*)* as a linear combination of 28 and 12.  OR  B. Find GCD and LCM of 28*,* 12 and verify that GCD X LCM = product of the numbers. | Understand | CO1 |
| 13. | Find the eigen values of the matrix  OR  Is the system of equations  2x+3y = 11  4x+6y = 13  Consistent? Justify your answer. | Understand | CO4 |
| 14. | A. Compute the rank of the matrix  OR  B. Find an eigen vector of the matrix | Analyse | CO3 |
| 15. | A. Show that 11 X 14*n* +1 is a composite number for any positive integer n.  OR  B. If *ac* ≡ *bc (*mod *m)* and *(c,m)* = 1, prove that *a* ≡ *b (*mod *m)*. | Apply | CO2 |

**Part D. 24 Marks**. Time: 60 Minutes

Long Answer. 6 Marks Each. Answer all 4 questions, **choosing among options within each question**. (Cognitive Level: Understand/Apply/Analyse/Evaluate/Create)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 16. | A. Prove that the product of any two integers of the form 4*n*+1 is also of the same form.  OR  B. Find the remainder when 3247 is divided by 25. | Understand | CO2 |
| 17. | A. Using Cramer’s rule find the solution for the system of equations    OR  B. Solve the linear system | Understand | CO3 |
| 18. | What kind of conic section (or pair of straight lines) is given by the quadratic form 3x+8xy-3? Explain.  OR  B. Diagonalize the matrix | Analyse | CO4 |
| 19. | A. Find the highest power of 3 that divides 1001!  OR  B. Prove that no integer of the form 8*n*+ 7 can be expressed as a sum of three squares. | Apply | CO1 |

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| **Cognitive Level** | **Marks** | **Percentage** |  | **Course Outcomes** | **Marks** | **Percentage** |
| Remember | 10 | 17.85 |  | CO 1 | 16 | 29 |
| Understand | 24 | 42.87 |  | CO 2 | 13 | 23 |
| Apply | 12 | 21.43 |  | CO 3 | 14 | 25 |
| Analyse | 10 | 17.85 |  | CO 4 | 13 | 23 |
| Evaluate | 0 | 0 |  |  |  |  |
| Create | 0 | 0 |  |  |  |  |
| **TOTAL** | **56** | **100** |  | **TOTAL** | **56** | **100** |