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| **University of Kerala** | | |
| Discipline: **Mathematics** |  | Time: 2 Hours (120 Mins.) |
| Course Code: UK1DSCMAT101 |  | Total Marks: 56 |
| Course Title: Differential Calculus and Linear Algebra |  |  |
| 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 quotient rule of differentiation. | Remember | CO 1 |
| 2. | State Rolle’s theorem. | Remember | CO 2 |
| 3. | Find the derivative of . | Understand | CO 2 |
| 4. | Find the rank of the matrix | Understand | CO 3 |
| 5. | Define rank of a matrix. | Remember | CO 3 |
| 6. | State Cayley- Hamilton theorem | Remember | CO 3 |

**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. | Find the slopes of the tangent lines to the curve  at the points and | Remember | CO 2 |
| 8. | Find the critical points of | Remember | CO 1 |
| 9. | Find the sum and product of the eigen values of the matrix | Remember | CO 3 |
| 10. | Solve the system using Cramer’s rule  . | Understand | CO 3 |
| 11. | Find the rank of the matrix | Apply | CO 3 |

**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. Use logarithmic differentiation to find  OR  B. Prove that is not differentiable at . | Understand | CO 1 |
| 13. | A. Suppose that x and y are differentiable functions of t and are related by the equation Find at time if and at time  OR  B. Find the absolute maximum and minimum values of the function on the interval  [1, 5], and determine where these values occur. | Understand | CO 2 |
| 14. | A. Find the number of solutions of the following system of equations  Justify.  OR  B. Solve the system of equations by Cramer’s rule. | Analyse | CO 3 |
| 15. | A. Find the determinant of the matrix  OR  B. Find the eigenvalues of the matrix, | Apply | CO 3 |

**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. (i) Use implicit differentiation to find for the Folium of Descartes .  (ii) Find an equation for the tangent line to the Folium of Descartes at the point  (iii) At what point(s) in the first quadrant is the tangent line to the Folium of Descartes horizontal?  OR  B. State and Prove Mean Value Theorem | Understand | CO 1 |
| 17. | A. Find the intervals on which is increasing and the intervals on which it is decreasing.  OR  B. A garden is to be laid out in a rectangular area and protected by a chicken wire fence. What is the largest possible area of the garden if only 100 running feet of chicken wire is available for the fence? | Understand | CO 2 |
| 18. | A. Find the rank of the matrix  OR  B. Solve by Cramer’s rule | Analyse | CO 2 |
| 19. | A. Diagonalize the symmetric matrix  OR  B. Find the eigenvalues and eigenvectors of | Apply | CO 3 |

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| **Cognitive Level** | **Marks** | **Percentage** |  | **Course Outcomes** | **Marks** | **Percentage** |
| Remember | 10 | 17.85 |  | CO 1 | 13 | 23.2 |
| Understand | 24 | 42.87 |  | CO 2 | 20 | 35.7 |
| Apply | 12 | 21.43 |  | CO 3 | 23 | 41.1 |
| Analyse | 10 | 17.85 |  |  |  |  |
| Evaluate | 0 | 0 |  |  |  |  |
| Create | 0 | 0 |  |  |  |  |
| **TOTAL** | **56** | **100** |  | **TOTAL** | **56** | **100** |