|  |  |  |
| --- | --- | --- |
| **University of Kerala** | | |
| Discipline: **Mathematics** |  | Time: 2 Hours (120 Mins.) |
| Course Code: **UK1DSCMAT108** |  | Total Marks: 56 |
| Course Title: DIFFERENTIAL CALCULUS |  |  |
| 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)

|  |  |  |  |
| --- | --- | --- | --- |
| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 1. | Define an increasing function. | Remember | CO2 |
| 2. | State chain rule. | Remember | CO1 |
| 3. | The value of is ……… | Understand | CO 1 |
| 4. | Define inflection points. | Understand | CO 2 |
| 5. | Find | Remember | CO 2 |
| 6. | State Rolle’s 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)

|  |  |  |  |
| --- | --- | --- | --- |
| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 7. | Find | Remember | CO 3 |
| 8. | Find | Remember | CO 2 |
| 9. | Find all critical points of | Remember | CO 3 |
| 10. | Find the slopes of the tangent lines to the curve  at the points and | Understand | CO 3 |
| 11. | Sketch the graph of | Understand | CO 2 |

**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)

|  |  |  |  |
| --- | --- | --- | --- |
| Qn.  No. | Question | Cognitive  Level | Course  Outcome (CO) |
| 12. | A. Find the derivative of  OR  B. Determine whether the function    Is continuous at | Understand | CO 1 |
| 13. | A. At what points, if any , does the graph of  have a horizontal tangent line.  OR  B. Find the intervals on which is increasing and the intervals on which it is decreasing. | Understand | CO 3 |
| 14. | A. Evaluate  OR  B. . Find | Analyse | CO 2 |
| 15. | A. Find the inflection points if any of  OR  B. Use implicit differentiation to find | Apply | CO 2 |

**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)

|  |  |  |  |
| --- | --- | --- | --- |
| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 16. | A. Explain continuous function. Show that is  continuous everywhere.  OR  B. Find (a)  (b) | Understand | CO 1 |
| 17. | A. (a) If . Find  (b) Find the area of the triangle formed from the  coordinate axes and the tangent line to the curve  at the point  OR  B. Let . By differentiating find the exact  locations of the horizontal tangent lines. | Understand | CO 3 |
| 18. | A. Consider the function  (a) Show that f has a differentiable inverse function.  (b) Use implicit differentiation to find a formula for  the derivative of  (c) Compute  OR  B. Let .  (a) Find formulas for and  (b) Evaluate and at with  Then make a sketch of showing the values  of and in the picture. | Analyse | CO 2 |
| 19. | A. Let Using first and second derivatives of f , Find the intervals where the function f is (i) increasing (ii) decreasing (iii) concave up (iv) concave down. Locate all the inflection points.  OR  B. Show that the function satisfies the hypotheses of the Mean-Value Theorem over the interval and find all values of c in the interval at which the tangent line to the graph of f is parallel to the secant line joining the points and . | Apply | CO 2 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cognitive Level** | **Marks** | **Percentage** |  | **Course Outcomes** | **Marks** | **Percentage** |
| Remember | 10 | 17.85 |  | CO1 | 14 | 25 |
| Understand | 24 | 42.87 |  | CO2 | 26 | 46 |
| Apply | 12 | 21.43 |  | CO3 | 16 | 29 |
| Analyse | 10 | 17.85 |  |  |  |  |
| Evaluate | 0 | 0 |  |  |  |  |
| Create | 0 | 0 |  |  |  |  |
| **TOTAL** | **56** | **100** |  | **TOTAL** | **56** | **100** |