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| **University of Kerala** | | |
| Discipline: **Mathematics** |  | Time: 2 Hours (120 Mins.) |
| Course Code: **UK1DSCMAT105** |  | Total Marks: 56 |
| Course Title: **Differentiation and Complex Numbers** |  |  |
| 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. | Define derivative of a function | Remember | CO 1 |
| 2. | The slope of the tangent to the curve at the point (1,1) is(a) 0 (b) 1 (c) -2 (d) -1 | Remember | CO 2 |
| 3. | Find | Understand | CO 1 |
| 4. | The function is   1. differentiable only at the point x =0 2. differentiable everywhere 3. discontinuous at 4. continuous everywhere | Understand | CO 1 |
| 5. | Find the modulus of the modulus of the complex number | Remember | CO 3 |
| 6. | Define an interior point of a set. | 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 derivative of with respect to where is a constant. | Remember | CO 1 |
| 8. | Solve the equation for where | Remember | CO 3 |
| 9. | Express the complex number in polar form. | Remember | CO 3 |
| 10. | Find | Understand | CO 1 |
| 11. | Let be the position of the particle. Find the average velocity of the particle over the time interval . | Apply | 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)

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| Qn.  No. | Question | Cognitive  Level | Course  Outcome (CO) |
| 12. | **A.** Find if  OR  **B.** Find the derivative of | Understand | CO 1 |
| 13. | **A.** If and are complex numbers, then prove that  OR  **B.** a)Show that Re(iz)=-Im(z) and Im(iz)=Re(z)  b) Evaluate | Understand | CO 3 |
| 14. | **A.** A 10 feet ladder leans against a wall at an angle with the horizontal. The top of the ladder is feet above the ground. If the bottom of the ladder is pushed towards the wall, find the rate at which changes with respect to when  OR  **B.** | Analyze | CO2 |
| 15. | **A.** Evaluate  OR  **B.** Evaluate | 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)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 16. | **A**. a) Check the continuity of the function  at  b) If and are continuous at , then prove that and are continuous at c.  OR  **B**. a) Prove that f(x)=|x| is not differentiable at x=0. Find the derivative of |x| if x. | Understand | CO 1 |
| 17. | A. Find the equation for the tangent line to the curve at the point  OR  B. Use implicit differentiation to find  if . | Understand | CO 2 |
| 18. | A. (a) Sketch the graph of the set and verify whether it is a domain.  (b) Solve the equation  OR  B. (a) Find all values of the cube root of  (b) Prove that is real if and only if | Analyse | CO 3 |
| 19. | A. Evaluate  OR  B. a) Using logarithmic differentiation, find the derivative of  b) If and are complex numbers, then prove that . | Apply | CO 2 |

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| **Cognitive Level** | **Marks** | **Percentage** |  | **Course Outcomes** | **Marks** | **Percentage** |
| Remember | 10 | 17.85 |  | CO 1 | 17 | 30 |
| Understand | 24 | 42.87 |  | CO 2 | 23 | 41 |
| Apply | 12 | 21.43 |  | CO 3 | 16 | 29 |
| Analyse | 10 | 17.85 |  |  |  |  |
| Evaluate | 0 | 0 |  |  |  |  |
| Create | 0 | 0 |  |  |  |  |
| **TOTAL** | **56** | **100** |  | **TOTAL** | **56** | **100** |