Reg. No.: .....

Name: .....

University of Kerala

U8756

Second Semester FYUGP Degree Examination, April 2025

Discipline Specific Core Course

MATHEMATICS

UK2DSCMAT100 - Theory of equations, Differential Calculus and Geometry

Academic Level: 100-199

Time: 1 Hour 30 Minutes(90 Mins.) **Max. Marks: 42**

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn No.	Question	CL	CO
1	Define natural exponential function.	RE	2
2	Give the parametric equations of a unit circle.	RE	4
3	What is the domain of the function f(x)=$(1/2)^x$.	UN	1
4	Eliminate t from $x = t^2$ and $y = 2t$.	UN	3
5	If $y = 3x + 5$ and $\frac{dy}{dt} = -1$, find $\frac{dx}{dt}$ when $x = 0$	UN	2
6	State First derivative Test.	UN	1

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	State Rolle's Theorem. Find the two *x*-intercepts of the function $f(x) = x^2 - 5x + 4$ and confirm that $f'(c) = 0$ at some point '*c*' between those intercepts.	UN	2
8	Find the critical points of $f(x) = x^3 - 6x^2 + 9x$.	UN	2
9	Find the polar coordinates (r, θ) of the points whose rectangular coordinates are $(2\sqrt{3}, -2), r \geq 0, 0 \leq \theta \leq 2\pi$	AP	2
10	Simplify $\log x + 5 \log x - \frac{1}{2}\log x$ into a single logarithmic function.	AP	2

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) a) Find the rectangular coordinates of the point whose polar coordinates is given in $(0, 5\pi)$ b) Express the given equation in polar coordinates $2x^2 + 2y^2 + 4y = 0$	AP	4, 4

Qn No.	Question	CL	CO
	OR B) a) Find the slope of the tangent line to the unit circle x = cos t, y = sin t, $0 \le t \le 2\pi$ at the point where $t = \pi/6$. b) Find the circumference of a circle of radius a from the parametric equation x = a cos t and y = a sin t.		
12	A) Find the interval on which the function $f(x) = 3x^4 - 4x^3$ is increasing , decreasing, concave up and concave down. Also find the point of inflection. OR B) State Mean Value Theorem and show that the function f(x)= (1/4) x^3+1 satisfies the hypothesis of Mean value Theorem over the interval [0,2] and find the values of c in the interval (0,2).	AN	2, 4
13	A) Evaluate i) $\lim_{x\to 0} \frac{\sin 2x}{\sin 3x}$ ii) $\lim_{x\to +\infty} xe^{-x}$ OR B) Sketch the graph of f(x)=1-2^x and find its domain and range.	EV	2, 2
14	A) A 17 ft ladder is leaning against a wall. If the bottom of the ladder is pulled along the ground away from the wall at a constant rate of 5 ft/s, how fast will the top of the ladder be moving down the wall when it is 8 ft above the ground? OR B) (a) Assume that oil spilled from a ruptured tanker spreads in a circular pattern whose radius increases at a constant rate of 2 ft/s.How fast is the area of the spill increasing when the radius of the spill is 60 ft. (b) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches .	CR	2, 2

Qn No.	Question	CL	CO