

Reg. No.:



Y8333

Name:

University of Kerala

Second Semester FYUGP Degree Examination, June 2026

Discipline Specific Core Course

MATHEMATICS

UK2DSCMAT100 - Theory of equations, Differential Calculus and Geometry

Academic Level: 100-199

2024 Admission onwards

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	State Extreme value theorem.	RE	2
2	Define concavity for a differentiable function.	RE	2
3	Express $\log_2 5$ in terms of Natural logarithms.	UN	1
4	Sketch the graph $\theta = \frac{\pi}{4}$ in polar coordinates.	UN	3
5	An interval on which $f(x) = x^2 - x$ satisfies the hypothesis of Rolles theorem is_____.	UN	2
6	If $A = x^2$, $\frac{dx}{dt} = 3$, find $\frac{dA}{dt} _{x=10}$	UN	2

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	Define critical points. Find all critical points of the function $f(x) = 3x^{5/3} - 15x^{2/3}$.	UN	2
8	Find $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$.	UN	1
9	Find the dimensions of all rectangles with given perimeter P and having maximum area .	AP	2
10	Use the First Derivative test to show that the function $f(x) = 3x^2 - 6x + 1$ has a relative minimum at $x = 1$	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 garden is to be laid out in a rectangular area and protected by a wire fence. What is the largest possible area of the garden if only 100 running feet of wire is available for the fence? OR B) A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 3 feet per second. How rapidly is the area enclosed by the ripple increasing at the end of	AP	2, 2

Qn No.	Question	CL	CO
	10 seconds.		
12	A) For the function $f(x) = x^3 - 3x^2 + 1$, determine the intervals on which f is increasing, decreasing, concave up and concave down. Also locate all inflection points. OR B) (a) Find all inflection points of $f(x) = x^4 + 2x - 3$, if any. Explain. (b) Find all critical points of $f(x) = 5x^{23} - 10x^{22}$.	AN	1, 4
13	A) Evaluate the following limits. (i) $\lim_{x \rightarrow \infty} \frac{e^{3x}}{x^2}$ (ii) $\lim_{x \rightarrow \infty} \left(1 - \frac{3}{x}\right)^x$. (iii) $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$ (iv) $\lim_{x \rightarrow \infty} (\ln x - \ln(1 + x))$ OR B) (i). Expand the logarithm $\ln\left(\frac{x^2 \sin^3 x}{\sqrt{x^2 + 1}}\right)$ in terms of sums, differences, and multiples of simpler logarithms. (ii). Solve $e^{-2x} - 3e^{-x} = -2$ for x without using calculating utility.	EV	3, 4
14	A) Find the arclength of $x = \sin t + \cos t$, $y = \sin t - \cos t$ for $0 \leq t \leq \pi$ OR B) Sketch the trajectory over the time interval $0 \leq t \leq 10$ of the particle whose parametric equations of motion are $x = t - 3 \sin t$, $y = 4 - 3 \cos t$.	CR	4, 4