

Reg. No.:



Name:

University of Kerala

U8760

Second Semester FYUGP Degree Examination, April 2025

Discipline Specific Core Course

MATHEMATICS

UK2DSCMAT102 - Integration and Applications of differentiation

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	State Rolle's theorem	RE	4
2	Write reduction formula for $\int \tan^n x dx$	RE	2
3	A positive number x and its reciprocal are added together. The smallest possible value of this sum is obtained by minimizing $f(x) = \dots$ for x in the interval	UN	2
4	If $\int_0^1 f(x)dx = 2$, then $\int_1^0 f(x)dx = \dots$	UN	1
5	Find the interval on which $f(x) = x^3$ is increasing and decreasing.	UN	3
6	The graph of the function $y = x^3(3x - 4)(x + 2)^2$ is tangent to the x -axis and crosses the x -axis at $x = \dots$.	UN	3

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	Sketch the region and evaluate the integral by using a formula from geometry $\int_1^4 2dx$	UN	1
8	Evaluate $\int \sin 6x \sin 4x dx$	UN	2
9	A 10- foot ladder stands on a horizontal floor and leans against a wall. Use x to denote the distance along the floor from the wall to the foot of the ladder, and use y to denote the distance along the wall from the floor to the top of the ladder. If the foot of the ladder is dragged away from the wall, find an equation that relates the rates of change of x and y with respect to time.	AP	4

Qn No.	Question	CL	CO
10	Evaluate $\int_0^2 (5 - 3\sqrt{1-x^2}) dx$	AP	3

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) 1. Evaluate $\int \frac{dx}{1+3x^2}$ 2. Evaluate $\int \cos^3 x dx$. OR B) Evaluate $\int_{1-\pi}^{1+\pi} \sec^2\left(\frac{1}{4}x - \frac{1}{4}x\right) dx$	AP	1, 2
12	A) (a) Find the absolute maximum minimum values of the function $(x-2)^3$ on $[1, 4]$ and state where these values occur. (b) Find the relative extrema of $3x^{5/3} - 15x^{2/3} + 15$. OR B) (i) Evaluate $\int x \tan^{-1} x dx$. (ii) Evaluate $\int_0^{\pi/4} \sin(4x) \cos(2x) dx$.	AN	3, 2
13	A) Let $f(x) = x^4 - 5x^3 + 9x^2$. Find the intervals on which f is increasing, decreasing, concave up, and concave down. Also locate all inflection points. OR B) Find the absolute maximum and minimum values of $f(x) = \frac{3x}{\sqrt{4x^2+1}}$ on $[-1, 1]$ and state where those values occur.	EV	2, 2

Qn No.	Question	CL	CO
14	A) The curve $y = x^3 - kx^2 + x - 3$ has two stationary points. Given that one of the stationary points is at $x = 1$. (a) Find the value of k. (b) Determine whether this stationary point is a relative maximum or minimum. (c) Find the x-coordinate of the other stationary point and its nature. OR B) Sketch the region whose signed area is represented by the definite integral, and evaluate the integral using an appropriate formula from geometry: (a) $\int_1^4 2dx$, (b) $\int_{-1}^2 (x + 2)dx$, (c) $\int_0^2 (x - 1)dx$.	CR	3, 1