

Reg. No.:



W6870

Name:

University of Kerala

Third Semester FYUGP Degree Examination, November 2025

Discipline Specific Core Course

MATHEMATICS

UK3DSCMAT208-Geometry, Multivariate and Vector Calculus

Academic Level: 200-299

2024 Admission

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	When we say a curve $r(t)$ is a smooth function of t .	RE	2
2	The rectangular coordinates of the point whose polar coordinate is $(6, 2\pi / 3)$ is _____	RE	1
3	The equation of the parabola with focus $(p, 0)$ and directrix $x = -p$ is --- -----..	UN	1
4	Evaluate $\int_0^2 (5i + 4tj) dt$.	UN	1
5	Given $f(x, y) = xe^{-y} + 5y$. Find the slope of the surface $z = f(x, y)$ in the x direction at the point $(4,0)$.	UN	3
6	Evaluate $\int_0^3 \int_0^2 xy \, dx dy$.	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	Evaluate $\int_1^{3/2} \int_y^{3-y} y \, dx dy$	UN	3
8	Find the natural domain of $r(t) = \cos \pi t i - \ln t j + \sqrt{t-4k}$ at $t_0 = 7$	UN	1
9	Find a polar equation for the ellipse that has its focus at the pole and satisfies the stated conditions. Points are in polar coordinates and directrices in rectangular coordinates. Given $e = \frac{3}{4}$ and $d = 2$.	AP	1

Qn.No.	Question	CL	CO
10	Evaluate $\partial z / \partial x$ and $\partial z / \partial y$ if $z = x^4 \sin(xy^3)$.	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	<p>A)</p> <p>Find $r'(t) \times r''(t)$ for the function $r(t) = e^{-t} i + e^{-t} j + 2t k; t = 0$.</p> <p>OR</p> <p>B)</p> <p>The average value or mean value of a continuous function $f(x, y)$ over a rectangle $R = [a, b] \times [c, d]$ is defined as $f_{ave} = \frac{1}{A(R)} \iint_R f(x, y) dA$, where $A(R)$ is the area of the rectangle R. Suppose that the temperature in degrees Celsius at a point (x, y) on a flat metal plate is $T(x, y) = 10 - 8x^2 - 2y^2$, where x and y are in meters. Find the average temperature of the rectangular portion of the plate for which $0 \leq x \leq 1$ and $0 \leq y \leq 2$.</p>	AP	1
12	<p>A)</p> <p>Evaluate $\iint (2x - y^2) dA$ over the triangular region R enclosed between the lines $y = -x + 1$, $y = x + 1$ and $y = 3$.</p> <p>OR</p> <p>B)</p> <p>Given that $z = e^{xy}$, $x = 2u + v$, $y = u/v$, find $\partial z / \partial u$ and $\partial z / \partial v$ using the chain rule.</p>	AN	3
13	<p>A)</p> <ol style="list-style-type: none"> Find the length of the cardioid $r = 1 + \cos\theta$ in the first quadrant. Find the area of the region in the first quadrant that is within the cardioid $r = 1 - \cos\theta$ <p>OR</p>	EV	4

Qn.No.	Question	CL	CO
	B) Evaluate the triple integral $\iiint 12xy^2z^3 dV$ over the rectangular box G defined by the inequalities $-1 \leq x \leq 2, 0 \leq y \leq 3, 0 \leq z \leq 2$.		
14	A) Sketch the curve $x^2 + 2y^2 = 4$ OR B) Using polar double integral find the volume of a sphere having origin at center and radius a .	CR	1