

Reg. No.:



W6864

Name:

University of Kerala

Third Semester FYUGP Degree Examination, November 2025

Discipline Specific Core Course

MATHEMATICS**UK3DSCMAT201-Differential Equations, Multiple Integrals 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	State the condition for a vector field to be conservative.	RE	1
2	Write the standard form of homogeneous second order linear ordinary differential equation.	RE	1
3	Find $\text{div } \vec{F}$ where $\vec{F} = xz^2\vec{i} + 5xy^2z\vec{j} - 3x^2z^3\vec{k}$.	UN	1
4	Evaluate $\int_0^1 \int_0^1 xy^2 dx dy$.	UN	1
5	The first order Differential Equation $M(x, y)dx + N(x, y)dy = 0$ is said to be exact if-----	UN	1
6	Solution of the differential equation $y' = \cos x$ is	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	Find $\text{curl } \vec{F}$ at the point $(1, -1, 1)$ where $\vec{F} = xz^3\vec{i} - 2x^2yz\vec{j} + 2yz^4\vec{k}$.	UN	1
8	Evaluate $\int_0^a \int_0^b \int_0^c (x^2 + y^2 + z^2) dz dy dx$	UN	2
9	Solve $\frac{dy}{dx} + y = e^{-x}$.	AP	2
10	Evaluate $\int_C (5x + 2y)dx + (2x - y) dy$ where C is the parabolic arc $y = x^2$ from $(0, 0)$ to $(1, 1)$.	AP	3

Qn.No.	Question	CL	CO

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 work done by the force $\vec{F} = 3xy \vec{i} - y^2 \vec{j}$ when it moves a particle along the curve $y = 2x^2$ in the xy-plane from $(0, 0)$ to $(1, 2)$. (b) Applying Green's theorem, evaluate $\int_C y \tan^2 x \, dx + \tan x \, dy$ where C is the circle $x^2 + (y + 1)^2 = 1$ oriented counter clockwise. OR B) (a) Evaluate $\iint_R xy^2 \, dA$ where R is the triangular region bounded by $y = 0$, $x = y$ and $x + y = 2$. (b) Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy \, dy \, dx$	AP	1
12	A) Use a triple integral to find the volume of the solid within the cylinder $x^2 + y^2 = 9$ and between the planes $z = 1$ and $x + z = 5$ OR B) Solve $y'' + 4y' + 4y = e^{-2x} \sin 2x$ with $y(0) = 1$, $y'(0) = -1$.	AN	2
13	A) Find an integrating factor and solve the initial value problem $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0$, $y(0) = -1$	EV	3

Qn.No.	Question	CL	CO
	OR B) Evaluate the integral $\oint_C xy \, dy - y^2 \, dx$ where C is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$.		
14	A) Determine whether the vector field $\vec{F}(x, y) = y \hat{i} + x \hat{j}$ is conservative. If so find the scalar ϕ such that $\vec{F} = \nabla\phi$. Hence evaluate $\int_{(0,0)}^{(1,1)} \vec{F} \cdot d\vec{r}$ OR B) (a) By the method of undetermined coefficients, solve $y'' + 4y = e^{3x}$. (b) Solve the initial value problem $y'' + 5y' + 6y = 0, y(0) = 1, y'(0) = 2$.	CR	3