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TERM END EXAMINATIONS (TEE) – December 2021- January 2022

Programme	: B.Tech.	Semester	: Fall 2021-22
Course Name	: Calculus and Laplace Transform	Course Code	: MAT1001
Faculty Name	: Dr. Sheerin Kayenat	Slot / Class No	: D21+D22+D23 / 0489
Time	: 1½ hours	Max. Marks	: 50

Answer ALL the Questions

Q. No.	Question Description	Marks
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PART - A (30 Marks)

1 (a) Let 10

$$f(x, y) = \begin{cases} 0, & \text{when } x^2 < y < 2x^2 \\ 1, & \text{otherwise .} \end{cases}$$

Show that $f_x(0, 0)$ and $f_y(0, 0)$ exist but f is not differentiable at $(0, 0)$.

OR

(b) Sketch the region by labelling each bounding curve with its equation, and give the coordinates of the points where the curves intersect. Then, find the area of the region 10

$$\int_0^2 \int_{x^2-4}^0 dy dx + \int_0^4 \int_0^{\sqrt{x}} dy dx.$$

2 (a) Find the flux of the fields, $F_1 = 2x\hat{i} - 3y\hat{j}$ and $F_2 = 2x\hat{i} + (x - y)\hat{j}$ across the circle $r(t) = (a \cos t)\hat{i} + (a \sin t)\hat{j}$, $0 \leq t \leq 2\pi$. 10

OR

(b) Solve $(D + 2)(D - 1)^2 y = e^{-2x} + 2 \sinh x$ by method of undetermined coefficients. 10

3 (a) Solve 10

$$(1 + x)^2 \frac{d^2 y}{dx^2} + (1 + x) \frac{dy}{dx} + y = 4 \cos \log(1 + x).$$

OR

(b) Find the inverse Laplace transform of 10

$$\frac{2s^2 - 4}{(s-1)(s-2)(s-3)}$$

PART - B (20 Marks)

- 4 Find three numbers whose sum is 9 and whose sum of squares is minimum. 10
- 5 Solve the equation using Laplace transform 10
 $y'' - 3y' + 2y = 4t + e^{3t}$ when $y(0) = 1$, and $y'(0) = -1$.

