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MIDTERM EXAMINATIONS – OCTOBER 2021

Programme	B.Tech	Semester	Fall 2020-2021
Course Name	Calculus and Laplace Transform	Course Code	MAT1001
Faculty Name	Dr. Navneet Kumar Verma	Slot / Class No	(C11+C12+C13)/0131
Time	1½ hours	Max. Marks	50

Answer all the Questions

Q. No.	Question Description	Marks
1.	Expand $\sin(xy)$ about point $\left(1, \frac{\pi}{2}\right)$ up to second-degree terms using Taylor series expansion	10
2.	If $\theta = t^n e^{-\frac{r^2}{4t}}$, find what value of n will make $\frac{1}{r^2} \frac{\partial}{\partial r} \left(r^2 \frac{\partial \theta}{\partial r} \right) = \frac{\partial \theta}{\partial t}$	10
3.	Find the total area enclosed by the lemniscate of Bernoulli using the concept of polar coordinate system, the equation is given as $(x^2 + y^2)^2 = a^2(x^2 - y^2)$	10
4.	A triangular prism is formed by planes whose equations are $ay = bx$, $y = 0$ and $x = a$. Find the volume of the prism between the planes $z = 0$ and surface $z = c + xy$	10
5.	Find the directional derivatives of the function $\phi = x^2 - y^2 + 2z^2$ at the point P (1,2,3) in the direction of the line PQ where Q is the point (5,0,4)	10
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