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Mid Term Examinations – November 2021

Programme	:	B.Tech	Semester	:	Fall 2021-2022
Course	:	**Calculus and Laplace Transform**	Code	:	**MAT1001**
Faculty	:	**Dr. Anant Kant Shukla**	Slot/Class No.	:	**C11+C12+C13/BL2021 221000132**
Time	:	**1½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q. No.	Question Description	Marks
1	Suppose, you are in charge of erecting a radio telescope on a newly discovered planet. To minimize interference, you want to place radio telescope, where the magnetic field of the planet is weakest. Suppose, the planet is spherical with a radius of 6 units. Based on a coordinate system whose origin is at the centre of the planet, the strength of magnetic field is given by $6x - y^2 + xz + 60$. Where should you locate the radio telescope?	10
2	If $z = f(x, y)$ and $x = \frac{r}{2}(e^\theta + e^{-\theta})$, $y = \frac{r}{2}(e^\theta - e^{-\theta})$, then prove that $z_x^2 - z_y^2 = z_r^2 - r^{-2}z_\theta^2$.	10
3	Find area of the plane region bounded by the graph of $x = y^2$, $y - x = 3$, $y = -3$ and $y = 2$.	10
4	Find the volume of the solid which is below the surface $z = 2x + 3$ and above the xy−plane bounded by $y^2 = x$, $x = 0$ & $x = 2$.	10
5	(a)Evaluate $\int_{(0,0)}^{(2,1)}[(10x^4 - 2xy^3)dx - 3x^2y^2dy]$ along the path $x^4 - 6xy^3 = 4y^2$.	05
	(b)Evaluate $\oint_C \vec{r}.d\vec{r}$ where the notation $\vec{r}$ and C have their usual meanings.	05

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