

Reg. No.:

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

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|---------------------|--|------------------------|-------------------------|
| Programme | B.Tech.-MIM,BCE,BAC,BAI, BAS, BCE,BCG,BCY,BEC,BSA | Semester | Fall 2021-22 |
| Course Name | Calculus and Laplace Transforms | Course Code | MAT1001 |
| Faculty Name | Dr. Bhumika Choksi | Slot / Class No | B11+B12+B13/0148 |
| Time | 1½ hours | Max. Marks | 50 |

Answer ALL the Questions

| Q. No. | Question Description | Marks |
|---------------------------------------|--|-----------|
| PART - A – (3 x 10 = 30 Marks) | | |
| 1 | (a) If $\theta = t^n e^{-\frac{r^2}{4t}}$ then find 'n' such that $\frac{1}{r^2} \frac{\partial}{\partial r} \left(r^2 \frac{\partial \theta}{\partial r} \right) = \frac{\partial \theta}{\partial t}$. | 10 |
| | OR | |
| | (b) Evaluate $\int_0^2 \int_y^{2+\sqrt{4-2y}} dA$ by changing the order of integration. | 10 |
| 2 | (a) Verify Stokes' theorem for $\vec{A} = (x + y)\hat{i} + (y + z)\hat{j} - x\hat{k}$ over the surface in the first octant of the plane $2x + y + z = 2$. | 10 |
| | OR | |
| | (b) Solve $y'' + 4y = \sec 2t$; $y' \equiv \frac{d}{dt}$ by Variation of Parameter method. | 10 |
| 3 | (a) Solve $4x^2 y'' + y = 19 \cos(\ln x) + 22 \sin(\ln x)$; $y' \equiv \frac{d}{dx}$. | 10 |
| | OR | |
| | (b) Evaluate $\int_0^\infty e^{-t} \left(t \int_0^t e^{-4u} \cos u \, du \right) dt$. | 10 |
| Part - B – (2 x 10 = 20 Marks) | | |
| 4 | Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dx dy$ by transforming it into polar coordinates. | 10 |
| 5 | Find inverse Laplace transform of $\frac{s+2}{(s^2+4s+5)^2}$. | 10 |

