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| | **Reg. No.:** | |
| | **Name :** | |

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

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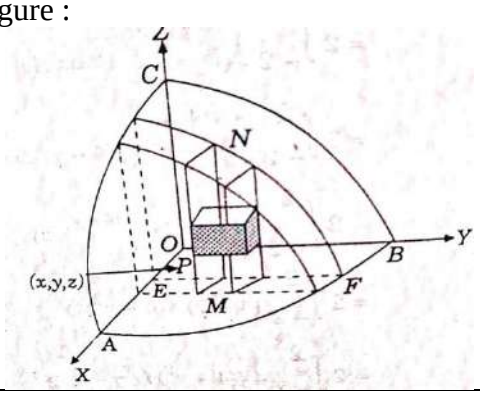
| **Programme** | : | **BTECH** | **Semester** | : | **Fall 2021-22** |
| **Course** | : | **Calculus and Laplace Transform** | **Code** | : | **MAT1001** |
| **Faculty** | : | **Dr. Yogesh Shukla** | **Slot/ Class No.** | : | **A11+A12+A13/BL20 21221000146** |
| **Time** | : | **1 ½ hours** | **Max. Marks** | : | **50** |

**Answer ALL the Questions**

| Q. No. | | Question Description | Marks |
|---|---|---|---|
| | | **PART - A ( 30 Marks)** | |
| 1 | (a) | If function $u = (1 - 2xy + y^2)^{-1/2}$ where u is dependent on x and y then prove that<br>$\frac{\partial}{\partial x}\left\{(1-x^2)\frac{\partial u}{\partial x}\right\} + \frac{\partial}{\partial y}\left\{y^2\frac{\partial u}{\partial y}\right\} = 0$ | 10 |
| | | OR | |
| | (b) | Find the volume which is bounded by ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$<br>As given in following figure :<br>  | 10 |
| 2 | (a) | Evaluate $\iint_s \vec{F}\hat{n}ds$ , $where\ \vec{F} = 18z\hat{\imath} - 12\hat{\jmath} + 3y\hat{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant. | 10 |
| | | OR | |
| | (b) | Solve the following linear differential equation<br>$\frac{d^2y}{dx^2} + 2y = x^2e^{3x} + e^x cos2x$ | 10 |

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|---|---|---|---|
| 3 | (a) | Using convolution theorem, evaluate the following $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$ | 10 |
| | | OR | |
| | (b) | Use Laplace transform methods to solve the following ODE $y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0$ where given that $y(0) = 1, y'(0) = 2, y''(0) = 2$ | 10 |
| **PART - B (20 Marks)** | | | |
| 4 | | Change the order of integration in $\int_0^a \int_{\sqrt{a^2-x^2}}^{x+2a} dxdy$ , and evaluate the same. | 10 |
| 5 | | Solve the following Cauchy's Homogeneous ordinary differential equation $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = x + x^2 logx + x^3$ | 10 |
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