

I B. Tech I Semester Supplementary Examinations, April - 2022
MATHEMATICS-I

Time: 3 hours

Max. Marks: 70

- Note: 1. Question paper consists of two parts (**Part-A** and **Part-B**)
2. Answering **ALL** the questions in **Part-A** is Compulsory
3. Answer any **THREE** Questions from **Part-B**

PART -A

1. a) Find the differential equation satisfying the relation $x = A \cos (mt-\alpha)$. (4M)
- b) Find the particular integral of $(D^2 - 1) y = xe^x$. (3M)
- c) Find L (cosh2t). (4M)
- d) Test whether $u = \frac{y}{x}, v = xy$ are linearly independent. (4M)
- e) Find the solution of $p^2+q=3$. (3M)
- f) Find the particular integral of $(D^2 - 4DD'+4D'^2)z = e^{2x+y}$. (4M)

PART -B

2. a) Solve $(y \cos x + \sin y + y)dx + (\sin x + x \cos y + x)dy = 0$. (8M)
- b) Find the orthogonal trajectories of $r = a(1 - \cos \theta)$. (8M)
3. a) Solve $(D^3 - 3D^2 + 4)y = e^{2x} + 6 + 80 \cos 2x$. (8M)
- b) Solve $(D^2 + 3D + 2)y = xe^x \sin x$. (8M)
4. a) Using Laplace transform of the following $\int_0^{\infty} e^{-t} t^2 \sin at dt$. (8M)
- b) Solve $(D^2 + 2D + 1)y = 3te^{-t}$ given that $y(0) = 4, y'(0) = 2$. (8M)
5. a) Expand $f(x, y) = e^{-x+y}$ in the neighborhood of (1, 1). (8M)
- b) Find the point on the plane $x + 2y + 3z = 4$ that is closest to the origin. (8M)
6. a) Solve the one dimensional heat equation $\frac{\partial u}{\partial x} = c^2 \frac{\partial^2 u}{\partial x^2}$ with boundary conditions (8M)
 $\left(\frac{\partial u}{\partial x}\right)_{(0,t)} = 0 = \left(\frac{\partial u}{\partial x}\right)_{(1,t)}$ and initial condition $u(x, 0) = x$ for $0 \leq x \leq 1$.
- b) Solve $(D^3 - 7DD'^2 - 6D'^3)z = \sin(x+2y)$. (8M)
7. a) Find the differential equation arising from $\phi(x + y + z, x^2 + y^2 + z^2) = 0$. (8M)
- b) Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$. (8M)