

MATHEMATICS-I

(Common to All Branches)

Time: 3 hours

Max. Marks: 70

Question Paper Consists of **Part-A** and **Part-B**
 Answering the question in **Part-A** is Compulsory,
 Three Questions should be answered from **Part-B**

PART-A

- Solve the D.E $(3xy^2 - y^3)dx - (2yx^2 - xy^2)dy = 0$
 - Find the Particular integral of $(D^2+a^2) y = \text{cosec}ax$
 - Find $J\left(\frac{u,v}{x,y}\right)$ if $u = \frac{x+y}{1-xy}, v = \tan^{-1}(x) + \tan^{-1}(y)$
 - Find $L^{-1}\left(\frac{s^2}{(s-3)^2}\right)$
 - Solve $px^2+qy^2=z(x+y)$
 - Write the possible solutions of one dimensional heat equations.

[4+4+3+4+4+3]

PART-B

- Find the orthogonal trajectories $x^2+(y-c)^2 = c^2$ where c is a arbitrary constant
 - Bacteria in a culture grows exponentially so that the initial number has doubled in three hours .How many times the initial number will be present after 9 hours.

[8+8]
- Solve the D.E $(D^3 + 2D^2 - D - 2)y = 1 - 4x^3$
 - Solve the D.E $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin 2x$

[8+8]
- Find (i) $L(te^{at}\sin bt)$ (ii) $L^{-1}\left(\frac{s}{(s^2+1)^2}\right)$
 - By apply Laplace transform method solve the D.E $(D^2 + 4D + 3)y = e^{-t}$ $y(0) = 1, y'(0) = 1.$

[8+8]
- Find the extreme of $f(x, y) = 2(x^2-y^2)-x^4+y^4$
 - Expand $e^x \sin y$ in terms of x and y by Taylors method

[8+8]
- Solve the PDE $(x^2 + y^2)(p^2 + q^2) = 1$
 - Solve the PDE $(x^2 - yz)p + (y^2 - zx)q = (z^2 - xy)$

[8+8]
- A rectangular plate is bounded by the lines $x = 0, y = 0, x = a, y = b$ and the edge temperatures are $u(0,y) = 0 = u(a, y)$ and $u(x,0) = 5\sin(5\pi x/a) + 35\sin(3\pi x/a)$.Find the steady state temperature.

