MODEL PAPER

Subject Code: R161102/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations Nov. - 2016

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**,
Four Questions should be answered from **Part-B**
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PART-A

1. (a) Solve the D.E $(1+xy)xdy+(1-xy)ydx=0$
   (b) Solve the D.E $\frac{d^2y}{dx^2}+\frac{dy}{dx}+y=0$
   (c) Find $L(te^{3t}\sin 3t)$
   (d) Evaluate $L^{-1}\left\{\int_s^\infty \log\left(\frac{u-1}{u+1}\right)du\right\}$
   (e) If $u=x\log xy$ where $x^3+y^3+3xy=1$, $find\ \frac{du}{dx}$
   (f) From the partial differential equation of family of cones having vertex at origin.
   (g) Solve $\frac{\partial^3 z}{\partial x^3}-3\frac{\partial^3 z}{\partial x^2 \partial y}+4\frac{\partial^4 z}{\partial y^3}=0$

PART-B

2. (a) Solve: $(\text{xy} \sin xy + \cos xy)y\,dx + (xy\sin xy - \cos xy)x\,dy = 0$
   (b) The number of N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after 3/2 hours?

[7+7]

3. (a) Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \text{x}\,\text{e}^{\text{x}}\cos x$
   (b) Consider an electrical circuit containing an inductance L, Resistance R and capacitance C. let q be the electrical charge on the condenser plate and '*i*' be the current in the circuit at any time. Given that L = 10 henries, R = 120 ohms, q = 1000 farads and There is applied E.M.F 17 sin 2t in the circuit. At time zero the current is zero and the charge is 1/2000 coulomb. Then find the charge on the capacitor

[7+7]

4. (a) State convolution theorem and use it to evaluate $\mathcal{L}^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$
   (b) Solve $y'' + 2y' + 5y = e^{-t}sint; y(0) = y'(0) = 1$, using Laplace transforms

[7+7]

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5. (a) A rectangular box in which is open at the top has capacity 256cu.units. Determine the dimensions of the box such that the least material is required for the construction of the box. Use the method of Lagrange's method of multipliers to obtain the solution
   (b) Prove that $u = \frac{x^2-y^2}{x^2+y^2}, v = \frac{2xy}{x^2+y^2}$ are functionally dependent and find the relation between them.

[7+7]

6. (a) Solve $x(y^2+z)p - y(x^2+z)q = z(x^2-y^2)$
   (b) Form the partial differential equation by eliminating ϕ from $\phi\,(x+y+z,\ x^2+y^2-z^2) = 0$

[7+7]

7. (a) Solve $\left(D^2 - D'^2 - 3D + 3D'\right)z = xy + e^{x+2y}$
   (b) Solve $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial z}{\partial x\partial y} + 3\frac{\partial^2 z}{\partial y^2} = \sqrt{x+3y}$

[7+7]

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