Code No: R161102 **R16** SET - 1

I B. Tech I Semester Supplementary Examinations, November - 2020
MATHEMATICS-I

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) Solve the ODE $ydx - xdy = 3x^2 e^{x^3} y^2 dx$ (2M)

b) Solve the DE $\frac{d^2x}{dt^2} + x = 0$ given that $x(0)=2,\ x\left(\frac{\pi}{2}\right) = -2$ (2M)

c) Expand sinx about origin using Taylor's theorem. (2M)

d) if $f(x,y,z) = e^{x^2+y^2+z^2}$ then find $\frac{\partial^3 f}{\partial x \partial y \partial z}$ (2M)

e) Find $L^{-1}\left\{\frac{s}{s^2+4s+5}\right\}$ (2M)

f) Solve p - q = x - y. (2M)

g) Classify the nature of the PDE $\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial^2 u}{\partial x \partial y} = 0$ (2M)

PART -B

2. a) Find orthogonal trajectories of the Family of curves $x^{2/3} + y^{2/3} = a^{2/3}$, where 'a' is the parameter. (7M)

b) A resistance of 1 00 ohms an inductance of 0.5 henry are connected in series with a battery of 20 volts. Find the current in the circuit as a function of t, if initially there is no current in the circuit. (7M)

3. a) Solve the DE $(D^2 - 1)y = e^{-x}\sin(e^{-x}) + \cos(e^{-x})$ by the method of variation of parameters. (7M)

b) An electric consists of an inductance of 0.1 henries a resistance of 20 ohms and a condenser of 25 micro farads. Find the charge q and the current i at any time t, given that q(0) = 0.05 and f(0) = 0. (7M)

4. a) Find$L\{f(t)\}$where $f(t)$ is a periodic function of period2π and is given by (7M)

$$f(t) = \begin{cases} sint, & 0 < t < \pi \\ 0, & \pi \le t < 2\pi \end{cases}$$

b) Using Laplace transform, solve $y(t) = 1 - e^{-t} + \int_0^t y(t-u) sinu\, du.$ (7M)
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5. a) Find the extreme value of $x^2 - y^2$ subject to $x^2 + 2y^2 + 3z^2 = 1$. (7M)

b) Prove that the functions $u = x^2e^{-y}\cosh z$, $v = x^2e^{-y}\sinh z$ and $w = 3x^4e^{-2y}$ are functionally dependent and hence find the relation between them. (7M)

6. a) Find partial differential equation by eliminating arbitrary function $z = f(x^2 - y) + g(x^2 + y)$ (7M)

b) Solve the PDE $q^2 = z^2p^2(1 - p^2)$ (7M)

7. a) Solve the PDE $\left(D^2 - DD^1 - 2D\right)z = \sin(3x + 4y)$ (7M)

b) Solve the PDE $\left(D + D^1 - 1\right)\left(D + 2D^1 - 3\right)z = 4 + 3x + 6y$ (7M)