Code No: R13102 **R13** SET - 1

I B. Tech I Semester Supplementary Examinations, November - 2020
MATHEMATICS-I
(Com. to all branches)

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 **THREE** Questions from **Part-B**

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PART –A

1. a) A Find the orthogonal trajectories of $r = a(1-\cos\theta)$. (4M)

b) Solve the differential equations. (4M)

$y^{11} - 2y^{1} + 10y = 0$, Given y (0) = 4, y1 (0) = 1.

c) Solve $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ and $u(0, y) = e^{-5y}$ by the method of separation of variables. (4M)

d) Expand $\log\sin x$ in powers of $(x-3)$ using Taylor's series method. (4M)

e) Find inverse Laplace transform of $\frac{6s-5}{s^2+7}$ (3M)

f) From the partial differential equation by eliminating arbitrary constants from the $z = axy$ (3M)

PART -B

2. a) Solve the D.E $(x^2 + y^2 + x)dx + xydy = 0$. (8M)

b) If air is maintained at 20^{0}C and temperature of the body cools from 80^{0}C to 60^{0}C in 10 minutes. Find the temperature of the body after 30 minutes. (8M)

3. a) Solve the D.E $\left(D^2 - 4D + 4\right)y = x^2\sin x + e^{2x} + 3$ (8M)

b) Solve the D.E $\left(D^2 + 1\right)y = x^2\cosh x$ (8M)

4. a) If$L\{f(t)\} = log\left(\frac{s+3}{s+1}\right)$then find(i)$L\{f(2t)\}$ (ii) $L\{e^{3t}\ f(2t)\}$ (8M)

b) Find $L^{-1}\left\{\frac{s}{(s^2+\omega^2)^2}\right\}$ Using convolution theorem. (8M)
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5. a) 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. (8M)

b) Find extreme values of the function $f(x, y) = \cos x + \cos y + \cos(x + y)$ (8M)

6. a) Find complete and singular solutions of the $z = px + qy + \frac{p}{q} - p$. (8M)

b) Solve the PDE $z(x - y) = px^2 - qy^2$ (8M)

7. A tightly stretched with fixed end points x = 0, x = l is initially at rest in its equilibrium position. If it is vibrating by giving to each of its points a velocity $\lambda x(l - x)$. Find the displacement of the string at any distance x from one end a long time t. (16M)