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

I B. Tech I Semester Supplementary Examinations, January - 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) Solve the D.E $y\left(2x^2y+e^x\right)dx=\left(e^x+y^3\right)dy$ (4M)

b) Solve the D E $\frac{d^4y}{dx^4}+6\frac{d^3y}{dx^3}+11\frac{d^2y}{dx^2}+6\frac{dy}{dx}=0$ (3M)

c) If $L\{f(t)\}=\bar{f}(s)$ then show that $L\{sinhat\,f(t)\}=\frac{1}{2}\left[\bar{f}(s-a)-\bar{f}(s+a)\right]$ (4M)

d) Find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ if $u=\sqrt{x^2-y^2}\sin^{-1}\left(\frac{y}{x}\right)+\frac{x^2-y^2}{\sqrt{x^2+y^2}}$ (4M)

e) From the PDE by eliminating arbitrary constants $x^2+y^2+(z-c)^2=r^2$ (4M)

f) Solve the PDE $\left(D^2-a^2D^{1^2}\right)z=0$ (3M)

PART –B

2. a) Solve the D.E $2xy\,dy=\left(x^2+y^2+1\right)dx$ (8M)

b) The growth rate of bacteria population is proportional to its size. Initially the population is 10,000 after 5 days it is 20,000. What is the population after 15 days? (8M)

3. a) Solve the D.E $\left(D^3-1\right)y=\left(e^x+1\right)^2$ (8M)

b) Solve $(D^2+5D+6)y=\sin 2x+x.e^{2x}$ (8M)

4. a) Show that $\int_0^\infty e^{-2t}\frac{sinht}{t}\,dt=\frac{1}{2}log3$ (8M)

b) Solve the DE using transform method $(D^4-k^4)y=0,\quad y(0)=1, y'(0)=0, y''(0)=0, y'''(0)=0$ (8M)
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5. a) Find the minimum and maximum value of $x + y + 2z$ subject to $x^2 + y^2 + z^2 = 3$ Using Lagrange's multiplier method. (8M)

b) If $x = \sqrt{vw}, y = \sqrt{wu}, z = \sqrt{uv}, x = r\sin\theta\cos\phi, y = r\sin\theta\sin\phi, w = r\cos\theta$ then find $J\left(\frac{x, y, z}{r, \theta, \phi}\right)$ (8M)

6. a) Solve the PDE (y +z)p +(z + x)q = x +y (8M)

b) Solve the PDE $(x^2 + y^2)(p^2 + q^2) = 1$ (8M)

7. a) Solve the PDE $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial y} = u$ and $u(x,0) = 3e^{-5x} + 2e^{-3x}$ by method of separation of variables. (8M)

b) Solve the wave equation $\frac{\partial^2 y}{\partial x^2} = c^2 \frac{\partial^2 y}{\partial t^2}$ subject to the following conditions. (8M)

1. $y(0,t) = 0$
2. $y(\pi,t) = 0$
3. $y(x,0) = 2(Sinx + Sin3x)$
4. $\frac{\partial y}{\partial t}(x,0) = 0$