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

I B. Tech I Semester Supplementary Examinations, Oct/Nov - 2018
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) Find the orthogonal trajectory of family of curves $x^{2/3}+y^{2/3}=a^{2/3}$, where ‘a’ is the parameter. (4M)

b) Solve the differential equations (4M)

$$\frac{d^2x}{dt^2}+x=0 \text{ , given that } x(0)=2,\ x\left(\frac{\pi}{2}\right)=-2$$

c) Solve $\frac{\partial^2 z}{\partial x^2}=\frac{\partial z}{\partial y}+2z$ by the method of separation of variables. (4M)

d) if x = rcosθ , y = rsinθ , evaluate $J=\frac{\partial(x,y)}{\partial(r,\theta)}$ and $J^1=\frac{\partial(r,\theta)}{\partial(x,y)}$ (4M)

e) Show that the function f(t) = t^3 is of exponential order and find its Laplace transform. (3M)

f) Form the partial differential equation by eliminating arbitrary constants from the $z=ax+a^2y^2+b$ (3M)

PART -B

2. a) Solve the D.E $r\sin\theta-\cos\theta\frac{dr}{d\theta}=r^2$ (8M)

b) The temperature of a cup of coffee is 92^{0}C, when freshly poured the room temperature being 24^{0}C. In one minute it was cooled to 80^{0}C. How long a period must elapse, before the temperature of the cup becomes 65^{0}C.? (8M)

3. a) Solve the D.E $(D^2-4)\,y=x\sinh x+54x+8$ (8M)

b) Solve the D.E $(D^3-3D^2+4)\,y=(1+e^{-x})^3$ (8M)

4. a) Find $L\left\{\frac{t^{n-1}}{1-e^{-t}}\right\}$ (8M)

b) Find $L^{-1}\left\{log\left(\frac{s+1}{s-1}\right)\right\}$ (8M)
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5. a) Find the maximum and minimum distance of the point $(3,4,12)$ from the Sphere $x^2+y^2+z^2=1$ using Lagrange's function. (8M)

   b) Expand $\log(1+e^x)$ by Maclaurn's series. Hence deduce that (8M)

$$\frac{e^x}{1+e^x}=\frac{1}{2}+\frac{x}{4}-\frac{x^3}{48}+....$$

6. a) Find complete and singular solutions of the $z = px + qy + 2\sqrt{pq}$ (8M)

   b) Solve the PDE $2xzp + 2yzq = z^2 - x^2 - y^2$ (8M)

7. A bar of 50cm long with insulated sides kept at 0^0 C and that the other end is kept at 100^0 C until steady state conditions prevail. The two ends are suddenly insulated so that the temperature is zero at each end thereafter. Find the temperature distribution. (16M)