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)

$\frac{d^2x}{dt^2} + x = 0$, 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 92^0C, when freshly poured the room temperature being 24^0C. In one minute it was cooled to 80^0C. How long a period must elapse, before the temperature of the cup becomes 65^0C.? (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)

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

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)