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

I B. Tech I Semester Supplementary Examinations, May - 2017
MATHEMATICS-I
(Common to all branches)

Time: 3 hours Max. Marks: 70

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

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PART –A

1. a) Find the orthogonal trajectory of the family of curves $xy = c$. (2M)
   b) Solve $\frac{d^2y}{dx^2} + 8\frac{dy}{dx} + 16y = 0$. (2M)
   c) Find the Laplace Transform of $\sin^3 at$. (2M)
   d) Find the inverse Laplace Transform of $\frac{s+1}{s^2+2s+2}$. (2M)
   e) Write Chain rules for Partial differentiation. (2M)
   f) Form PDE from $z = ax + by + a^2 + b^2$. (2M)
   g) Find the complementary function of $4\frac{\partial^2 z}{\partial x^2} + 12\frac{\partial^2 z}{\partial x \partial y} + 9\frac{\partial^2 z}{\partial y^2} = 0$. (2M)

PART –B

2. a) Solve $\frac{dy}{dx} + x\sin 2y = x^3 \cos^2 y$. (7M)
   b) Find the orthogonal trajectory of the cardioids $r^2 = a^2 \sin 2\theta$. (7M)

3. a) Solve $\left(D^2 + 2\right) y = x^2 e^{3x} + e^x \cos 2x$, *where* $D = \frac{d}{dx}$. (7M)
   b) Solve the following D.E. by the method of variation of parameters: (7M)
   $\frac{d^2y}{dx^2} + a^2 y = \sec ax$.

4. a) Find the Laplace Transform of $\left\{\left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3\right\}$. (4M)
   b) Find $L^{-1}\left\{\frac{s}{s^4 + s^2 + 1}\right\}$. (5M)
   c) Solve the following differential equation by the transform method; (5M)
   $\left(D^2 + n^2\right) x = a \sin(nt + \alpha)$, $x = Dx = 0$ *at* $t = 0$ *where* $D = \frac{d}{dt}$.
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5\. a) Determine whether the following functions are functionally dependent or not. If functionally dependent, find the functional relation between them: (7M)

$u = \frac{x}{y}, \quad v = \frac{x+y}{x-y}$.

b) Discuss the maxima and minima of $f(x, y) = x^3 y^2 (1 - x - y)$. (7M)

6\. a) Obtain the partial differential equation by eliminating the arbitrary constants from the equation $z = (x^2 + a^2)(y^2 + b^2)$. (4M)

b) Solve the partial differential equation $(x^2 - y^2 - z^2)\, p + 2xyq = 2xz$. (5M)

c) Solve the PDE $zpq = p + q$. (5M)

7\. a) Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$. (7M)

b) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = \cos(2x + y)$. (7M)