

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**

PART -A

1. a) Find the orthogonal trajectory of the family of curves $xy = c$. (2M)
- b) Solve $\frac{d^2 y}{dx^2} + 8 \frac{dy}{dx} + 16y = 0$. (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 $(D^2 + 2)y = x^2 e^{3x} + e^x \cos 2x$, where $D = \frac{d}{dx}$. (7M)
- b) Solve the following D.E. by the method of variation of parameters: (7M)
 $\frac{d^2 y}{dx^2} + a^2 y = \sec ax$.
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)
 $(D^2 + n^2)x = a \sin (nt + \alpha)$, $x = D x = 0$ 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 $f(x, y) = x^3y^2(1-x-y)$. (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)