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

I B. Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2017

MATHEMATICS-I

Time: 3 hours (Comm. to All Branches) 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) State Newton's Law of cooling. (2M)
b) Solve the D.E $\left(D^2-8D+9\right)y=0$ (2M)
c) Show that the function $f(t)=t^2$ is of exponential order 3. (2M)
d) Find Inverse Laplace transform of $\frac{S-1}{S^2+5^2}$ (2M)
e) Find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ if $u=\frac{x^3y^3}{x^3+y^3}$ (2M)
f) From the partial differential equation by eliminating arbitrary constants from $z=ax+by+ab$ (2M)
g) Classify the nature of $2\frac{\partial^2 u}{\partial x^2}+3\frac{\partial^2 u}{\partial y^2}=0$ the partial differential equations. (2M)

PART -B

2. a) Find the charge and current in RC circuit if R = 20 ohms, c = 0.01 farad, and E(t) = 20 sin 2t with q(0) = 0. (7M)
b) If 30% of radioactive substance disappears in 10 days, how long will it take for 90% of it to disappear? (7M)

3. a) At the end of three successive seconds, the distance of a point moving with simple harmonic motion from its mean position, measured in the same direction are 1, 5, 5. Then find the complete oscillation. (7M)
b) Solve the D.E $(D^2+9)y=cosec3x$ by the method of variation of parameters. (7M)

4. a) Show that $\int_0^\infty \frac{sin2t+sin3t}{te^t}\,dt=\frac{3\pi}{4}$. (7M)
b) Find $L^{-1}\left\{\frac{1}{s^2(s^2+1)^2}\right\}$ using convolution theorem. (7M)

5. a) Find the extreme values of $f(x,y)=x^3+3xy^2-3x^2-3y^2+7$. (7M)
b) Expand f(x) = log sinx about x = 3 using Taylor's series expansion. (7M)

6. a) Solve the $(x+2z)p+(4z-y)q=2x+y$ partial differential equation. (7M)
b) Show that the complete integral of $z=px+qy-2p-3q$ represents all possible planes through the point (2, 3, 0). (7M)

7. a) Solve the PDE $\left(D^2-3D-D^{1^2}+3D^1\right)z=xy+e^{x+2y}$. (7M)
b) Solve the PDE $\left(D^2-DD^1\right)z=\sin x\cos 2y$. (7M)

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Code No: R161102 **R16** SET - 2

I B. Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2017
MATHEMATICS-I

Time: 3 hours (Comm. to All Branches) 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) Solve the D.E $\left(x^2+y^2\right)dx+2xy\,dy=0$. (2M)

b) Find the P.I of $\left(D^2-5D+6\right)y=e^{4x}$ (2M)

c) Evaluate $\int_0^{\infty} e^{-5t}\,\delta(t-2)\,dt$. (2M)

d) Find inverse Laplace transform of $\frac{1}{s}sin\frac{1}{s}$. (2M)

e) Find $\frac{\partial^3 f}{\partial x\partial y\partial z}$ for f(x,y,z) = e^{xyz} (2M)

f) Form the partial differential equation by eliminating arbitrary constants from $z=ax+by+\sqrt{a^2+b^2}$. (2M)

g) Find the P.I of $\left(D^2-D^{1^2}\right)z=\cos(x+y)$. (2M)

PART -B

2\. a) Find orthogonal trajectories of the Family of circles $x^2+y^2+2fy+1=0$, *f* being the parameter. (7M)

b) Solve the D.E $y\left(x^4y^4+x^2y^2+xy\right)dx+x\left(x^4y^4-x^2y^2+xy\right)dy=0$ (7M)

3\. a) Solve the D.E (D^2+9) y=sec 3x by method of variation of parameters. (7M)

b) Solve the D.E $\left(D^2-3D+2\right)y=\sin\left(e^{-x}\right)$ (7M)

4\. a) Show that $\int_0^{\infty} e^{-2t}\frac{sinht}{t}\,dt=\frac{1}{2}log3$ (7M)

b) Solve the D.E $y''-6y'+9y=t^2e^{3t}$ if $y(0)=2, y'(0)=6$ using Laplace transforms method. (7M)
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5. a) 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 $J\left(\frac{x,y,z}{r,\theta,\phi}\right)$. (7M)

b) Expand f(x,y) = $xy^2 + \cos(xy)$ in powers of $(x-1)(y-\frac{\pi}{2})$. (7M)

6. a) Solve the PDE $\left(\frac{p}{2}+x\right)^2+\left(\frac{q}{2}+y\right)^2=1$. (7M)

b) Solve the $yp-xq=-xe^{x^2+y^2}$ partial differential equation. (7M)

7. a) Solve the PDE $\left(D^2-DD^1+D^1-1\right)z=\sin(x+2y)$ (7M)

b) Solve the PDE $\left(D^2-2DD^1\right)z=e^{2x}+x^3y$ (7M)

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Code No: R161102 **R16** SET - 3

I B. Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2017
MATHEMATICS-I

Time: 3 hours (Comm. to All Branches) 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) Write the Bernoulli's equation in 'y'. (2M)

b) Find the P.I of $(D^2+1)y = x^2$. (2M)

c) Find $L^{-1}\left\{\frac{1}{s-6}-\frac{2}{s^2+3}+\frac{3}{s^4}\right\}$ (2M)

d) If $L^{-1}\left\{\frac{e^{-1/s}}{s^{1/2}}\right\} = \frac{cos2\sqrt{t}}{\sqrt{\pi t}}$ then find $L^{-1}\left\{\frac{e^{-a/s}}{s^{1/2}}\right\}$ (2M)

e) Find $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}$ for f(x, y) $=log\sqrt{x^2+y^2}$. (2M)

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

g) Classify the nature of $x\frac{\partial^2 u}{\partial x^2} + y\frac{\partial^2 u}{\partial y^2} = 0 \; if \; xy > 0$ the partial differential equations. (2M)

PART -B

2. a) An RL circuit has an Emf given (in volts) by 4 sin t, a resistance of 100 ohms, an inductance of 4 henries with no initial current. Find the current at any time t. (7M)

b) Find the orthogonal trajectory of $r = a(sec\theta + tan\theta)$. (7M)

3. a) Solve the D.E $(D^2+D)\,y = \frac{1}{1+e^x}$. (7M)

b) Solve the D.E $(D^3+1)\,y = \cos(2x-1) + x^2 e^{-x}$. (7M)

4. a) Evaluate $\int_0^{\infty}\frac{cosat-cosbt}{t}\,dt$. (7M)

b) Solve the D.E $y'' + 2y' + 5y = 8sint + 4\,cost,\; y(0) = 1 \; and \; y\left(\frac{\pi}{4}\right) = \sqrt{2}$ Using Laplace transform method. (7M)
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5. a) If $u = \frac{x^2 y^2}{x+y}$ then find (i) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ (ii) $x\frac{\partial^2 u}{\partial x \partial y} + y\frac{\partial^2 u}{\partial y^2}$. (7M)

b) Prove that $JJ^1 = 1$ if $u = \frac{yz}{x}, v = \frac{zx}{y}, w = \frac{xy}{z}$. (7M)

6. a) Solve the PDE $z^2(p^2 + q^2) = 1$. (7M)

b) Solve the $\left(\frac{y-z}{yz}\right)p + \left(\frac{z-x}{zx}\right)q = \frac{x-y}{xy}$ partial differential equation. (7M)

7. a) Solve the PDE $\left(D^2 - 2DD^1 + D^{1^2}\right)z = 2x\cos y$. (7M)

b) Solve the PDE $\left(D^2 + 2DD^1 - 8D^{1^2}\right)z = \sqrt{2x+3y}$. (7M)

I B. Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2017

MATHEMATICS-I

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Write the equation to represent RC circuit. (2M)
   b) Solve the D.E$(D^4+m^4)y=0$. (2M)
   c) Find$L^{-1}\left\{\frac{1}{(s^2+1)(s^2+9)}\right\}$. (2M)
   d) Find$L^{-1}\left\{\frac{3}{\left(s-\frac{\pi}{2}\right)^4}\right\}$. (2M)
   e) Find $\lim\limits_{\substack{x\to1\\ y\to1}}\left(\frac{2xy}{x^2+y^2+1}\right)$. (2M)
   f) Form the partial differential equation by eliminating arbitrary constants from $z=ax+by+a^2+b^2$. (2M)
   g) Find the P.I of $\left(D^2-D^{12}\right)z=e^{x+y}$. (2M)

PART –B

2. a) Solve the D.E $\left(2xy^4e^y+2xy^3+y\right)dx+\left(x^2y^4\ e^y-x^2y^2-3x\right)dy=0$ (7M)
   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 coaled to 80^{0}C. How long a period must elapse, before the temperature of the cup becomes 65^{0}C. (7M)

3. a) Solve the D.E$\left(D^2+2D+1\right)y=x.\cos x$. (7M)
   b) Determine the charge on the capacitor at any time t > 0 in a series RLC circuit having an E.M.F E(t) = 100 sin 60 t, a resistor of 2 ohms, an inductor of 0.1 henries and capacitor of $\frac{1}{260}$ farads, if the initial current in the inductor and charge on the capacitor are both zero. (7M)
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4. a) Evaluate $L\left\{\int_0^{t/2}\frac{1-e^{-2x}}{x}\,dx\right\}$. (7M)

b) Find inverse Laplace transform of $\frac{s}{s^4+s^2+1}$. (7M)

5. a) Find $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}$ if $u=\operatorname{cosec}^{-1}\left(\frac{\sqrt{x}+\sqrt{y}}{x^{1/3}+y^{1/3}}\right)^{1/2}$ (7M)

b) Find the extreme values of following using Lagrange's multiplier method xy subject to $3x^2+y^2=6$. (7M)

6. a) Find the general solutions of the partial differential equations $y(x-z)p+(z^2-xz-x^2)q=y(2x-z)$. Hence obtain the particular solution which passes through the ellipse $z=0,\ 2x^2+4y^2=1$. (7M)

b) Solve the PDE $(1+y)p+(1+x)q=z$. (7M)

7. a) Solve the PDE $\left(D^2+DD^1-6D^{1^2}\right)z=x^2\sin(x+y)$. (7M)

b) Solve the PDE $\left(D^3-D^{1^3}\right)z=x^3y^3$. (7M)