Subject Code: R161102/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations December - 2016

MATHEMATICS-I

(Common to all branches)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**

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PART-A

1. (a) Find the orthogonal trajectory of $r = \frac{2a}{1+\cos\theta}$

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

   (c) Find L(f(t)) where $f(t) = \begin{cases} e^t & if\ 0 < t < 1 \\ 0 & if\ t > 1 \end{cases}$

   (d) Evaluate $L^{-1}\left[\frac{2s^2 - 1}{(s^2+1)(s^2+4)}\right]$

   (e) Find $\frac{du}{dx}$ If $u = \sin(x^2 + y^2),\ where\ \ a^2x^2 + b^2y^2 = c^2$

   (f) Solve the PDE pq $(px + qy - z)^3 = 1$

   (g) Classify the Nature of PDE $\frac{\partial^2 u}{\partial x^2} + 2\frac{\partial^2 u}{\partial x \partial y} + 4\frac{\partial^2 u}{\partial y^2} = 0$

[7 x 2 = 14]

PART-B

2. (a) Solve the D.E $\frac{dy}{dx} = \frac{x^2 + y^2 + 1}{2xy}$

   (b) A resistance of 100 ohms, an inductance of 0.5 Henry is connected in series with a battery of 20 volts. Find the current in the circuit, if initially there is no current in the circuit

[7+7]

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

   (b) Consider an electrical circuit containing an inductance L, Resistance R and capacitance C. let q be the electrical charge on the condenser plate and *'i'* be the current in the circuit at any time. Given that L = 0.25 henries, R = 250 ohms, q = $2\text{x}10^{-6}$ farads and there is no applied E.M.F in the circuit. At time zero the current is zero and the charge is 0.002 coulomb. Then find the charge (q) and current (i) at any time.

[7+7]

|''|'||||''|''||'|||

4. (a) Evaluate $L^{-1}\left[\frac{1}{2}\log\left\{\frac{s^2+b^2}{s^2+a^2}\right\}\right]$

   (b) Solve $\left(D^2-1\right)x = a\cosh t \;\; if \;\; x(0)=0, x^1(0)=0.$ using Laplace transform method.

[7+7]

5. (a) Find the dimensions of a rectangular parallelopipid box open at the top of max capacity whose surface area is 108 sq inches.

   (b) If $u = x+y+z, u^2v = y+z, u^3w = z$ *then find* $J\left(\frac{u,v,w}{x,y,z}\right)$

[7+7]

6. (a) Solve $x(y^2+z)p - y(x^2+z)q = z(x^2-y^2)$

   (b) Solve the PDE $p^2q^2 + x^2y^2 = x^2q^2\left(x^2+y^2\right)$

[7+7]

7. (a) Solve the PDE $\left(D+D^1-1\right)\left(D+2D^1-3\right)z = 4+3x+6y$

   (b) Solve the PDE $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 2\sin y - x\cos y$

[7+7]

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Subject Code: R161102/R16 **Set No - 2**

I B. Tech I Semester Regular Examinations December - 2016

MATHEMATICS-I

(Common to all branches)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**
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PART-A

1. (a) Solve the D.E $\left(x+2y^3\right)\frac{dy}{dx}=y$
   (b) Find the P.I of $\left(D-1\right)^2(D+2)y=e^x$
   (c) Find $L(\sin 2t \sin 3t)$
   (d) Evaluate $L^{-1}\left[\frac{3s+1}{\left(s+1\right)^4}\right]$
   (e) Find $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}$ if u = f(x + y, x-y)
   (f) Solve the PDE pq = p + q.
   (g) Solve the PDE $\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{\partial x \partial y}+\frac{\partial z}{\partial y}-z=0$

[7 x 2 = 14]

PART-B

2. (a) Find the Orthogonal trajectory of the family of confocal conics $\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1$, where λ is a Parameter.
   (b) The number of N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after 3/2 hours?

[7+7]

3. (a) Solve the D.E $\left(D^2+1\right)y=\sec^2 x$ by the Method of variation parameters
   (b) Consider an electrical circuit containing an inductance L, Resistance R and capacitance C. Let q be the electrical charge on the condenser plate and '*i*' be the current in the circuit at any time. There is applied E.M.F Esinωt in the circuit. Then find the charge on the capacitor.

[7+7]

4. (a) Evaluate $\int_0^\infty e^{-t}\frac{\sin^2 t}{t}dt$ using Laplace transform
   (b) Solve $\left(D^4-k^4\right)y=0$ *if* $y(0)=1, y^1(0)=0, y^{11}(0)=0, y^{111}(0)=0.$ using Laplace transform method

[7+7]

5. (a) Find the point in the plane $2x+3y-z=5$ which is nearest to the origin.

   (b) Prove that $u = x\sqrt{1-y^2} + y\sqrt{1-x^2}, v = \sin^{-1}(x)+\sin^{-1}(y)$ are functionally dependent and find the relation between them.

[7+7]

6. (a) Solve the PDE $z(y-x) = qy^2 - px^2$

   (b) Solve the PDE $z^2\left(p^2+q^2\right) = x^2 + y^2$

[7+7]

7. (a) Solve the PDE $\left(D^2 - DD^1 - 2D\right)z = \sin(4y+3x)$

   (b) Solve $\frac{\partial^2 z}{\partial x^2} - 6\frac{\partial^2 z}{\partial x \partial y} + 9\frac{\partial^2 z}{\partial y^2} = 12x^2 + 36xy$

[7+7]

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Subject Code: R161102/R16 **Set No - 3**

I B. Tech I Semester Regular Examinations December - 2016

MATHEMATICS-I

(Common to all branches)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**

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PART-A

1. (a) Write the working Rule to find the orthogonal trajectory of the curve f(x, y, c) = 0
   (b) Solve the D.E $\left(D^2+1\right)^2(D-1)y=0$
   (c) Find $L(\sqrt{t}e^{-3t})$
   (d) Evaluate $L^{-1}\left[\frac{1}{s\left(s+1\right)^3}\right]$
   (e) Find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ if $u=\sin^{-1}\left[\frac{x^2y^2}{x+y}\right]$
   (f) Form the partial differential equation by eliminating a and b from z = $(x^2+a)(y^2+b)$
   (g) Find the P.I of $\left(D-D^1-1\right)\left(D-D^1-2\right)z=e^{2x-y}$

[7 x 2 = 14]

PART-B

2. (a) Solve the D.E : $\left(x^3y^2+x\right)dy+\left(x^2y^3-y\right)dx=0$
   (b) If the temp of a cup of coffee is 92^0C when freshly poured in a room having temperature 24^0C, in one minute it was cooled to 80^0C. How long a period must elapse, before the temp. of the cup becomes 65^0C? A body kept in air with temp 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C.

[7+7]

3. (a) Solve the D.E $\left(D^2+3D+2\right)y=xe^x\sin x$
   (b) Consider an electrical circuit containing an inductance L, Resistance R and capacitance C. let q be the electrical charge on the condenser plate and '*i*' be the current in the circuit at any time. Given that L = 0.1 henries, R = 20 ohms, q = $25\text{x}10^{-6}$ farads and there is no applied E.M.F in the circuit. At time zero the current is zero and the charge is 0.05 coulomb. Then find the charge (q) and current (i) at any time

[7+7]

4. (a) Find Laplace transform of unit impulse function
   (b) Solve $\left(D^3 + D^2\right)x = 6t^2 + 4\ if\ \ x(0) = 0, x^1(0) = 2, x^{11}(0) = 0.$ using Laplace transform method.

[7+7]

5. (a) Find the Maximum and minimum distance of the point (1, 2, 3) from the sphere $x^2+y^2+z^2 = 1$
   (b) Expand $xy^2 + \cos xy$ in powers of (x-1) and (y-π/2) up to second degree terms.

[7+7]

6. (a) Solve the PDE $x^2p^2 + y^2q^2 = 1$
   (b) Solve the PDE $(y + z)p - (z + x)q = x - y$

[7+7]

7. (a) Solve the PDE $\frac{\partial^2 z}{\partial x^2} + \frac{\partial z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = y\cos x$
   (b) Solve the PDE $(D^3 - 7DD'^2 - 6D'^3)Z = \sin(x + 2y) + e^{2x+y}$

[7+7]

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Subject Code: R161102/R16 **Set No - 4**

I B. Tech I Semester Regular Examinations December - 2016

MATHEMATICS-I

(Common to all branches)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Four Questions should be answered from **Part-B**

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PART-A

1. (a) Solve the D.E $(1+y\cos)dx+\sin xdy=0$

   (b) A particle is executing simple harmonic motion with amplitude 5 meters and time 4 seconds. Find the time required by the particle in passing between points which are at distances 4 and 2 meters from the centre of the force and is on the same side of it.

   (c) Find L (f (t)) where $f(t)=\begin{cases}\cos\left(t-\frac{2\pi}{3}\right) & if\ t>\frac{2\pi}{3}\\ 0 & if\ t<\frac{2\pi}{3}\end{cases}$

   (d) Evaluate $L^{-1}\left\{\frac{1}{(s^2+1)(s^2+9)}\right\}$

   (e) If $u=\sqrt{x^2+y^2}, v=\tan^{-1}\left(\frac{y}{x}\right)$ $then\ \ find\ J\left(\frac{u,v}{x,y}\right)$

   (f) From the partial differential equation of from by eliminating f and g from z = f(y)+g(x+ y).

   (g) Find the P.I of $\left(D^2+3DD^1+2D^{1^2}\right)z=12xy$

[7 x 2 = 14]

PART-B

2. (a) Show that the family of curves $r^n=a\sec n\theta$ & $r^n=b\cos ecn\theta$ are orthogonal

   (b) A voltage Ee^{-at} is applied to a circuit containing Inductance L and resistance R , then find the current in the circuit, if initially there is no current in the circuit

[7+7]

3. (a) Solve the D.E $\left(D^4+2D^2+1\right)y=x^2\cos x$

   (b) Consider an electrical circuit containing an inductance L, Resistance R and capacitance C. Let q be the electrical charge on the condenser plate and *'i'* be the current in the circuit at any time. Given that L = 0.1 henries, R = 2 ohms, q = 1/260 farads and there is applied E.M.F 100sin 60t in the circuit. At time zero the current and the charge are both zero. Then find the charge on the capacitor and current in the circuit.

[7+7]

4. (a) State convolution theorem and use it to evaluate $L^{-1}\left[\frac{1}{\left(s^2+4s+13\right)^2}\right]$

   (b) Solve $\left(D^3+D\right)x=2\ if\ \ x(0)=3, x^1(0)=1, x^{11}(0)=-2.$ using Laplace transform method

[7+7]

5. (a) Find the extreme points of f(x, y) = 1-x^2-y^2

   (b) Expand $Tan^{-1}\left(\frac{y}{x}\right)$ in powers of (x-1) and (y-1) up to third degree terms hence evaluate f (1.1 , 0.9) approximately.

[7+7]

6. (a) Solve the PDE p cos (x +y) + q sin (x + y) = z

   (b) Solve the PDE $(x+y)(p+q)^2+(x-y)(p-q)^2=1$

[7+7]

7. (a) Solve $\left(D^2-D'^2-3D+3D'\right)z=xy+e^{x+2y}$

   (b) Solve the PDE $\frac{\partial^2 z}{\partial x^2}-\frac{\partial z}{\partial x\partial y}-2\frac{\partial^2 z}{\partial y^2}=(y-1)e^x$

[7+7]

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Subject Code: R13102/R13 **Set No - 1**

I B. Tech I Semester Supplementary Examinations December - 2016

MATHEMATICS-I

(Common to All Branches)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (a) State Newton's law of cooling and write the corresponding differential equation.
   (b) Solve $\frac{dy}{dx}+\frac{y}{x}=x^3-3$
   (c) Find the Laplace transform of Heaviside function.
   (d) Expand $f(x,y)=e^x \sin y$ in powers of x and y using McLaurin's series.
   (e) Solve $p^2+q^2=m^2$.
   (f) Write one dimension wave equation and its possible solutions.

[3+4+4+4+3+4]

PART –B

2. (a) Solve $2xydy-(x^2+y^2+1)dx=0$.
   (b) Suppose that an object is heated to 300°F and allowed to cool in a room maintained at 80°F. If after 10 minutes, the temperature of the object is 250°F, what will be its temperature after 20 minutes?

[8+8]

3. (a) Solve $y''-2y'+2y=e^x+\cos x$.
   (b) Solve $y''-2y'+y=x.e^x.\sin x$

[8+8]

4. (a) Are the functions $u=x+y+z$, $v=x^2+y^2+z^2$, $w=x^3+y^3+z^3-3xyz$ functionally independent?
   (b) Examine the function $f(x,y)=x^4+y^4-2x^2+4xy-2y^2$ (x>0, y>0) for extreme values .

[8+8]

5. (a) Find $L[t\, e^t \sinh t]$
   (b) Find the solution of $y''+y=\sin 3t$, $y(0)=y'(0)=0$.

[8+8]

6. (a) Form the partial differential equation formed by eliminating the arbitrary constants from $Z=ax^3+by^3$.
   (b) Solve $x(y-z)p+y(z-x)q=z(x-y)$.

[8+8]

7. (a) Solve $(D^3-4D^2D'+4DD'^2)z=2\sin(3x+2y)$, where D= $D=\frac{\partial}{\partial x}$, $D'=\frac{\partial}{\partial y}$.
   (b) Using the method of separation of variables, Solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6.e^{-3x}$.

[8+8]

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Subject Code: R10102/R10 **Set No - 1**

I B.Tech I Semester Supplementary Examinations December - 2016

MATHEMATICS-I

(Common to All Branches)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Solve $z' + \frac{z}{x}\log z = \frac{z}{x}(\log z)^2$.

   (b) Find the orthogonal trajectories of the family of curves $r = \frac{2a}{1+\cos\theta}$

[8+7]

2. (a) Solve $(D^2 + 4D + 5)y = e^{-2x}(1+\cos x)$.

   (b) Solve $(D^2 + 3D + 2)y = x$.

[8+7]

3. (a) If $u = \frac{2yz}{x}, v = \frac{3xz}{y}, w = \frac{4xy}{z}$. Calculate $\frac{\partial(x,y,z)}{\partial(u,v,w)}$.

   (b) Examine the function $x^3 + y^3 - 3axy$ for maxima & minima.

[8+7]

4. Trace the curve $y^2(a-x) = x^3, a > 0$.

[15]

5. (a) Find the area of the surface generated by revolving the curve $y = x^2$ included between $x = 0$ and $x = \frac{6}{5}$ about y-axis.

   (b) Find the volume of solid generated by revolving the plane area bounded by $y^2 = 4x$ and x = 4 about x = 4.

[8+7]

6. (a) Evaluate $\int_0^1\int_0^{1-x} e^{\frac{y}{x+y}}\,dydx$.

   (b) Evaluate $\int_R xydxdy$ where R is the region bounded by the parabola $x^2 = 4y$ and $y^2 = ax$.

[8+7]

7. (a) Find the directional derivative of $xy + yz + zx$ in the direction of $i + 2j + 2k$ at (1, 2, 0)

   (b) Find the constants a and b so that $(2xy + 3yz)i + (x^2 + axz - 4z^2)j + (3xy + 2byz)k$ is irrotational.

[8+7]

8. Verify Green's theorem for $\oint_C [(2x - y^3)dx - xydy]$ where c is the boundary of the region enclosed by $x^2 + y^2 = 1$ and $x^2 + y^2 = 9$.

[15]

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