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

I B. Tech I Semester Supplementary Examinations Sept. - 2014

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**
*****

PART-A

1. (i) Find the orthogonal trajectories of family of curves $r^n = asinn\theta$
 (ii) Solve $\frac{d^2y}{dx^2} - 4y = xsinhx$
 (iii) Find the Laplace transform of $(\sqrt{t} - \frac{1}{\sqrt{t}})^3$
 (iv) Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2ulogu$, where $u = e^{x^2+y^2}$
 (v) Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$
 (vi) Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial y} = x^2 + y^2$

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

PART-B

2.(a) Solve $xy(1 + xy^2)\frac{dy}{dx} = 1$
 (b) Solve $y(xy + 2x^2y^3)dx + x(xy - x^2y^2)dy = 0$

[8+8]

3.(a) Solve $(D^2 - 1)y = xsin3x + cosx$
 (b) A particle of mass m executes S.H.M in the line joining the points A and B, on a smooth table and is connected with these points by elastic strings whose tensions is equilibrium are each T. If l, l^1 be the extensions of the string beyond their natural lengths, find the time of oscillation.

[8+8]

4.(a) Find the Laplace transform of $\frac{cosat - cosbt}{t} + tsinat$.
 (b) Solve $\frac{d^2x}{dt^2} + 9x = cos2t$, if $x(0) = 1, x\left(\frac{\pi}{2}\right) = -1$

[8+8]

5.(a) Expand $e^x \log(1 + y)$ in powers of x and y up to terms of third degree.
 (b) In a plane triangle, find the maximum value of $cosacosbcosc$.

[8+8]

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

[8+8]

7.(a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin\frac{n\pi x}{l}$
 (b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = c^2\frac{\partial^2 u}{\partial x^2}$ under the conditions $u(0, t) = 0, u(l, t) = 0\ \forall t$; $u(x, 0) = f(x)$ and $(\frac{\partial u}{\partial t})_{t=0} = g(x), 0 < x < l$.

[8+8]

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

Subject Code: R13102/R13 **Set No - 2**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

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**
*****

PART-A

1.(i) Find the orthogonal trajectories of the family of cardioids $r = a(1 + cos\theta)$

(ii) Solve the $(D^2 - 4D + 3)y = sin3xcos2x$

(iii) Find the Laplace transform of $sinh3tcos^2t$

(iv) If u = $sin^{-1}\frac{x}{y} + tan^{-1}\frac{x}{y}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$

(v) Solve $\frac{y^2z}{x}p + xzq = y^2$

(vi) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial y} - z = e^{-x}$

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

PART-B

2.(a) Solve $(y - xy^2)dx - (x + x^2y)dy = 0$

(b) Solve $\frac{dy}{dx} + xsin2y = x^3cos^2y$

[8+8]

3.(a) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x sinx$

(b) An unchanged condenser of capacity C is charged by applying an e.m.f. $Esin\frac{t}{\sqrt{LC}}$, through leads of self-inductance L and negligible resistance. Prove that at any time t, the charge on One of the plates is $\frac{EC}{2}\left\{sin\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}cos\frac{t}{\sqrt{LC}}\right\}$

[8+8]

4.(a) Evaluate $L\left\{t\int_0^t \frac{e^{-t}}{t} sint\, dt\right\}$

(b) Find the inverse Laplace transform of $\log\left(\frac{s+1}{s-1}\right)$

[8+8]

5.(a) A rectangular box open at the top is to have volume of 32 cube ft. Find the dimensions of The box requiring least material for its construction.

(b) Expand $f(x, y) = x^y$ in powers of (x-1) and (y-1)

[8+8]

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

6.(a) Solve $p\sqrt{x} + q\sqrt{y} = \sqrt{z}$

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

[8+8]

7.(a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, o) = 6e^{-3x}$

(b) A tightly stretched string of length l, with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity $\vartheta_0 sin^3\frac{\pi x}{l}$. Find the displacement y(x,t).

[8+8]

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

Subject Code: R13102/R13 **Set No - 3**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

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**
*****

PART-A

1.(i) Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$

(ii) Solve $\frac{d^2y}{dx^2} + 2\frac{dx}{dy} + y = e^{2x} - cos^2x$

(iii) Find the Laplace transform of $e^{-1}sin^2t$

(iv) If $sinu = \frac{x^2y^2}{x^2+y^2}$ $, show\ that\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3tanu$

(v) Solve $xp - yq = y^2 - x^2$

(vi) Solve $4\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 16\log(x + 2y)$

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

PART-B

2.(a) Solve $sec^2y\frac{dy}{dx} + xtany = x^3$

(b) A body is originally at 80^0c cools down to 60^0c in 20 minutes, the temperature of the air being 40^0c . What will be the temperature of the body after 40 minutes from the original.

[8+8]

3.(a) Solve $(D^2 + 1)^2y = x^4 + 2sinxcos3x$

(b) Solve $\frac{d^2y}{dx^2} + a^2y = secax.$

[8+8]

4.(a) Find the Laplace transform of $te^{-t}sin3t.$

(b) Apply convolution theorem to evaluate $L^{-1}\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\}$

[8+8]

5.(a) Expand $x^2y + 3y - 2$ in powers of (x-1) and (y+2) using Taylors theorem.

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

[8+8]

6.(a) Solve the partial differential equation px+qy=1

(b) Solve $2z + p^2 + qy + 2y^2 = 0$

[8+8]

7.(a) Using the method of separation of variables, solve $py^3 + qx^2 = 0$

(b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x, 0) = 3sinn\pi x,\ u(0, t) = 0$ and $u(1, t) = 0$, where $0 < x < 1, t > 0.$

[8+8]

Subject Code: R13102/R13 **Set No - 4**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

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**
*****

PART-A

1.(i) Find the orthogonal trajectories of the family of cardioids $r = 2a(cos\theta + sin\theta)$

(ii) Solve $(D^2 + 1)y = x^4 + 2sinxcos3x$

(iii) Find the inverse Laplace transform $\frac{s^2}{(s-2)^3}$

(iv) Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2ulogu\ ,where\ \log u = \frac{(x^3+y^3)}{(3x+4y)}$

(v) Solve $(y^2 + z^2)p - xyq + zx = 0$

(vi) Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$

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

PART-B

2.(a) Solve $(y - xy^2)dx - (x + x^2y)dy = 0$

(b) Solve $y(xy + 2x^2y^3)dx + x(xy - x^2y^2)dy = 0$

[8+8]

3.(a) Solve $(D^2 + 1)^2 y = x^4 + 2sinxcos3x$

(b) Solve $(D^4 + D^2 + 1)y = e^{-x/2}cos\frac{\sqrt{3}}{2}x$.

[8+8]

4.(a) Solve $\frac{d^2x}{dt^2} + 9x = cos2t$, if $x(0) = 1, x\left(\frac{\pi}{2}\right) = -1$

(b) Find the Laplace transform of $te^{-t}sin3t$.

[8+8]

5.(a) A rectangular box open at the top is to have volume of 32 cube ft. Find the dimensions of The box requiring least material for its construction.

(b) In a plane triangle, find the maximum value of $cosacosbcosc$.

[8+8]

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

(b) Solve $2z + p^2 + qy + 2y^2 = 0$

[8+8]

7.(a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, o) = 6e^{-3x}$.

(b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(x, 0) = 3sinn\pi x,\ u(0, t) = 0$ and $u(1, t) = 0$, where $0 < x < 1, t > 0$.

[8+8]