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

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015

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) Solve the D.E $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$
   (b) Solve the D.E $(D^2-a^2)\, y = e^{-ax}+\sin ax$
   (c) Find the Laplace transform of $\frac{e^{at}-e^{bt}}{t}$
   (d) Find $J\left(\frac{u,v}{x,y}\right)$ *if* $u=e^x$ & $v=e^y$
   (e) Form the PDE by eliminating the arbitrary function $f(x+y+z, xy-z^2)=0$
   (f) Solve the PDE by variable separable method $\frac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$

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

PART-B

2. (a) Solve the D.E $(D^2+a^2)\, y = \sec ax$
   (b) A mass 'm' suspended from one end of a spring is subjected to force $f = f_0 \sin at$ in the direction of its length .The force f is measured positive vertically down words and time t = 0, m is at rest. If the spring constant is k, then find the displacement of m at time t.

[8+8]

3. (a) Solve the D.E $x(3ydx+2xdy)+8y^4(ydx+xdy)=0$
   (b) A body is heated to 105^0c and placed in a air at 15^0c .After 1 hour its temperature is 60^0c. How much time is required for it to cool 37^0c.

[8+8]

4. (a) Find the Laplace transform of (i) $L\{t.e^{-t}\, sin\, t\}$ (ii) $L\{sinh\, at.\, sin\, at\}$
   (b) Find $L^{-1}\left(\frac{s}{s^4+4a^4}\right)$

[8+8]

5. (a) Expand $e^{2x}\sin 3y$ in a Taylor's series about (0,0)
   (b) Find the maxima and minima of $x^3y^2(1-x-y)$

[8+8]

6. (a) Solve the PDE $z(z^2+xy)(px-qy) = x^4$
   (b) Solve the PDE $(D^2-DD^1)z = \cos x \cos 2y$

[8+8]

7. The ends A and B of rod 20cm long have the temperature at 30^0c and 80^0c until steady state prevail. The temperature of the ends are changed at 40^0c and 60^0c respectively .Find the temperature distribution in the rod at time t.

[16]

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

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015

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) Solve the D.E $\frac{dy}{dx}+\frac{y}{x}\log y=\frac{y}{x}(\log y)^2$
   (b) Solve the D.E $(D^2+a^2)\ y = e^{ax}+ \cos ax$
   (c) Find the Laplace transform of $\frac{\cos at-\cos bt}{t}$
   (d) Find $J\left(\frac{u,v}{x,y}\right)$ *if* $u=e^{x+y}$ & $v=e^{-x+y}$
   (e) Form the PDE by eliminating the arbitrary function f(xy+yz+zx,x+y+z) =0
   (f) Solve the PDE by variable separable method $\frac{\partial^2 z}{\partial x^2}=\frac{\partial z}{\partial y}+2z$

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

PART-B

2. (a) Solve the D.E $(D^2+a^2)\ y = \tan ax$.
   (b) A mass 4.9 kg is suspended from one end of a spring. A pull of 10 kg will stretch it to 5cm, The mass is pull down 6 cm below the static equilibrium position and then released. then find the displacement of mass at time t.

[8+8]

3. (a) Solve the D.E $xy\ (ydx + xdy) + x^2y^2(2ydx - xdy) = 0$
   (b) The rate of at which the bacteria multiply is proportional to the instantaneous number present .If the original number doubles in 2 hrs, in how many hours will it triple.

[8+8]

4. (a) Find the Laplace transform of periodic function $f(t)=\begin{cases} t/a & 0\le t\le a \\ (2a-t)/a & a\le t\le 2a \end{cases}$
   (b) Find $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$

[8+8]

5. (a) Using Taylor's series expand $e^x.\cos y$ near $(1,\pi/4)$
   (b) Find the maximum and minimum distance of the point (3, 4, 12) from the sphere $z^2+x^2+y^2=1$ using Lagrange's multiplier method.

[8+8]

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

6. (a) Solve the PDE $(x^2+y^2+yz)p+(x^2+y^2-xz)q = z(x+y)$
   (b) Solve the PDE $(D^3-2D^2 D^1)z = 2e^{2x}+3x^2y$.

[8+8]

7. A rod 100 cm long, with insulated sides has kept the temperature at 0^0c and 100^0c until steady state prevail. The two ends are suddenly insulated and kept so. Find the temperature distribution in the rod .

[16]

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

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015

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) Solve the D.E $\frac{dy}{dx}+\frac{y}{x\log x}=\frac{\sin 2x}{\log x}$
   (b) Solve the D.E $(D^2+4)\, y = x\, e^{2x}$
   (c) Evaluate $\int_0^\infty \frac{\sin t}{t}\,dt$
   (d) Find $J\left(\frac{u,v,w}{x,y,z}\right)$ *if* $u=x+y+z,\ uv=y+z, uvw=z$
   (e) Solve the PDE $xp-yq = y^2-x^2$
   (f) Solve the PDE by variable separable method $4\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}=3z$ *and* $z(0,y)=e^{-5y}$

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

PART-B

2. (a) Solve the D.E $(D^2+a^2)\, y = x\sin ax$
   (b) In an L-C-R circuit , the charge q on a plate of an condenser is given by $Lq^{11}+Rq^{1}+q/c = E\sin pt$. If initially the current and charge are zero .Then find current in the circuit.

[8+8]

3. (a) Solve the D.E $(x^2+y^2)dx-2xy\,dy=0$
   (b) Find the orthogonal trajectory of $r^n = a^n \cos n\theta$.

[8+8]

4. (a) Find the Laplace transform of periodic function $f(t)=\begin{cases}\sin at & 0\le t\le \pi/a\\ -\sin at & \pi/a\le t\le 2\pi/a\end{cases}$
   (b) Find $L^{-1}\left(\frac{s}{(s^2+a^2)(s^2+b^2)}\right)$ using convolution theorem.

[8+8]

5. (a) Expand $e^x\log(1+y)$ in a Taylor's series about (0,0)
   (b) Find the point on the plane of
   (i) $2x+3y-z = 5$ (ii) $3x-4y+5z = 26$ which is nearest to the origin.

[8+8]

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Subject Code: R13102/R13

Set No - 3

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

   (b) Solve the PDE $\left(D^2 - 4DD^1 + D^{1^2}\right)z = e^{2x+y}$

[8+8]

7. Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$ *subject to*

$$u(0, y) = 0 \ , \ u(l, y) = 0$$
$$u(x, 0) = 0 \ (0 < x < l)$$
$$u(x, l) = x(l - x)(0 < x < l)$$

[16]

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

I B.Tech I Semester Regular/Supple. Examinations Nov./Dec. - 2015

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) Solve the D.E $xy(1+xy^2)\frac{dy}{dx}=1$
   (b) Solve the D.E $(D^2+4D+4)\ y = e^{-2x}+x^2$
   (c) Evaluate $\int_0^{\infty} e^{-3t} t \sin t dt$
   (d) Find $J\left(\frac{u,v,w}{x,y,z}\right)$ *if* $u=yz/x,\ v=xz/y, w=xy/z$
   (e) Solve the PDE $z(p^2+q^2+1)=1$
   (f) Solve the PDE by variable separable method $3\frac{\partial z}{\partial x}+2\frac{\partial z}{\partial y}=0$ *and* $z(x,0)=4e^{-x}$

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

PART-B

2. (a) Solve the D.E $(D^2+a^2)\ y = \text{cosecax}$.
   (b) In an L-C-R circuit, the current 'i' is given by $Li^{11}+Ri^{1}+1/c = pE \text{ cospt}$. Then find current in the circuit 'i' when (i) $cR^2 > 4L$ (ii) $cR^2 < 4L$

[8+8]

3. (a) Solve the D.E $(x^2y-2xy^2)dx-(x^3-3x^2y)dy=0$
   (b) Find the orthogonal trajectory of $r^n = a^n \sin n\theta$

[8+8]

4. (a) Find the Laplace transform of periodic function $f(t)=\begin{cases}\cos at & 0\le t\le \pi/a \\ -\cos at & \pi/a\le t\le 2\pi/a\end{cases}$
   (b) Find $L^{-1}\left\{\frac{1}{(s-2)(s+2)^2}\right\}$ using convolution theorem.

[8+8]

5. (a) Expand $e^x.\sin y$ in powers of x & y
   (b) Find the Extrema of (i) $a^2-x^2-y^2$ (ii) x^3y^2-xy

[8+8]

Subject Code: R13102/R13

Set No - 4

6. (a) Solve the PDE (mz-ny)p+(nx-lz)q = (ly-mx)

   (b) Solve the PDE $\left(D^2 + DD^1 - 6D^{1^2}\right)z = \cos(2x + y)$

[8+8]

7. Solve the wave equation $c^2 \frac{\partial^2 y}{\partial x^2} = \frac{\partial^2 y}{\partial t^2}$ *subject to*

$$y(0,t) = 0 \ , \ y(l,t) = 0$$
$$y(x,0) = f(x) \ (0 < x < l)$$
$$\frac{\partial y}{\partial t}(x,0) = g(x)(0 < x < l)$$

Also find the solution (i) if f(x) $\neq$ 0, g(x) = 0 (ii) f(x) = 0, g(x) $\neq$ 0

[16]

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