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**

*****

PART-A

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

   (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 $L^{-1}\left\{\dfrac{2s^2-1}{(s^2+1)(s^2+4)}\right\}$

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

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

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

[7 x 2 = 14]

PART-B

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

   (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 $\left(D^3+1\right)y = \cos(2x-1) + x^2e^{-x}$

   (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 = 2x10^{-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]

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

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

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

[7+7]

6. (a) Solve+ −+ =−

   (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]

*****

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**

*****

PART-A

1. (a) Solve the D.E $\left(x + 2y^3\right)\frac{dy}{dx} = y$
   (b) Find the P.I of $(D-1)^2(D+2)y = e^x$
   (c) Find $L(\sin 2t \sin 3t)$
   (d) Evaluate $L^{-1}\left[\frac{3s+1}{(s+1)^4}\right]$
   (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 E$\sin\omega t$ in the circuit. Then find the charge on the capacitor.

[7+7]

$\infty \quad \sin^2 t$

4. (a) Evaluate $\int_0^{\infty} e^{-t} \frac{\quad}{t} dt$ using Laplace transform

(b) Solve $(D^4 - k^4) y = 0$ if $y(0) = 1, y^1(0) = 0, y^{11}(0) = 0, y^{111}(0) = 0$. using Laplace transform method

[7+7]

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

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]

*****

www.Jntufastresult.com

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**
*****

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 $(D^2+1)^2(D-1)y=0$
   (c) Find $L(\sqrt{t}\, e^{-3t})$
   (d) Evaluate $L^{-1}\dfrac{1}{s(s+1)^3}$
   (e) Find $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}$ if $u = \sin^{-1} x\ 2$
   (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 $(D-D^1-1)(D-D^1-2)z=e^{2x-y}$

[7 x 2 = 14]

PART-B

2. (a) Solve the D.E : $(x^3y^2+x)\,dy+(x^2y^3-y)\,dx=0$
   (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 $(D^2 + 3D + 2)y = xe^x \sin x$

(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]

Subject Code: R161109/R16 **Set No - 1**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

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**
*****

PART A

1. a) Find real root of the equation $3x = e^x$ by using Bisection method up to 3 approximations.

   b) Show that $e^x u_0 + x\, u_0 + \frac{x^2}{2!}\, {}^2u_0 + \ldots = u_0 + u_1 x + u_2 \frac{x^2}{2!} + \ldots$

   c) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Trapezoidal rule.

   d) Explain about Dirichlet's conditions for a Fourier expansion.

   e) The temperatures at one end of a bar OA of 50 cm length with insulated sides are kept at $0^o C$ at O and $100^o C$ at A until steady state conditions prevail. Find steady state temperature.

   f) If $F(p)$ is the complex Fourier transform of $f(x)$ then prove that $F\{f(ax)\} = \frac{1}{a} F \frac{p}{a}, a > 0$.

   g) Using Newton-Raphson method find square root of a number. (7×2 = 14M)

PART B

2. a) Solve $x^3 = 2x + 5$ for a positive root by regula-falsi method.

   b) Solve the system of equations by Newton Raphson method $3yx^2 - 10x + 7 = 0$ and $y^2 - 5y + 4 = 0$. (7M+7M)

Subject Code: R161109/R16 **Set No - 1**

3. a) Fit a interpolating polynomial in x for the following data

x	1	4	6	8	10
y	1	7	9	12	21

b) Using Lagrange's formula fit a polynomial to the data

x	0	2	5	9
f(x)	1	12	15	33

(7M+7M)

4. a) Evaluate $\int_0^2 \frac{dx}{x^3+x+1}$ by using Simpson's 1/3rd rule with h= 0.25.

b) Evaluate *y(0.8)* using Runge Kutta method given $y' = (x + y)^2$, y(0.4)= 0.41

(7M+7M)

5. a) Find the Fourier series of *xcosx* for 0<x< 2π.

b) Find half range Fourier sine series of f(x) = π-x in [0,π].

(7M+7M)

6. A tightly stretched flexible string has its ends fixed at x=0 and x= 10. At time t=0, the string is given a shape defined by f(x) = kx(10-x), where k is a constant and then released. Find the displacement of any point x of the string at any time.

(14M)

7. a) Find the Fourier transform of $\frac{1}{\sqrt{|x|}}$.

b) Find the inverse Fourier transform of f(x) of $F_s(p) = \frac{p}{1+p^2}$

(7M+7M)

Subject Code: R161109/R16 **Set No - 2**

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

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**
*****

PART A

1. a) Find positive root of the equation $x^3 - 2x - 5 = 0$ using Regula-Falsi method. Carry out two approximations.

   b) Find the missing term in the following table

X	0	1	2	3	4
Y	1	3	9	-	81

   c) The table below shows the temperature $f(t)$ as a function of time:

t	1	2	3	4	5	6	7
$f(t)$	81	75	80	83	78	70	60

   Using Simpson's $\frac{1}{3}$rd rule, evaluate $\int_1^7 f(t)dt$.

   d) Expand the function $f(x) = x^3$ as a Fourier series in $-\pi \le x \le \pi$.

   e) Write One-Dimensional wave equation with initial and Boundary conditions.

   f) If $F_s(p)$ and $F_c(p)$ are the Fourier sine and cosine transforms of $f(x)$ respectively, then prove $F_s[f(x)\cos ax] = \frac{1}{2}[F_s(p+a) + F_s(p-a)]$.

   g) Evaluate (i) $^2 e^{2x+3}$ (ii) $^2 \cos 2x$. (7×2 = 14M)

PART B

2. a) Using Regula-falsi method, find the real root of $2x - \log x = 6$ correct to three decimal places.

   b) Solve the system of equations by Newton Raphson method $x^2 + y^2 - 1 = 0$ and $y - x^2 = 0$. (7M+7M)

Subject Code: R161109/R16 **Set No - 2**

3. a) Fit a interpolating polynomial in x for the following data

x	0	1	2	3	4
y	-3	3	4	27	57

b) Find Interpolating polynomial by Lagrange's method and hence find f(2) for the following data

x	0	1	3	4
f(x)	-12	0	6	12

(7M+7M)

4. a) Evaluate $\int_0^{0.6} e^{-x^2}\,dx$ by using Simpson's $1/3^{rd}$ rule with h= 0.1.

b) Find y(74) given that *y(50)= 201, y(60)= 225, y(70)=248 and y(80)=274.* Using Newton's difference formula.

(7M+7M)

5. a) Expand cosπx in (0,1) as Fourier sine series.

b) Obtain the Fourier sin series of $f(x) = e^{-x}$ in the interval $0<x<2\pi$. (7M+7M)

6. The ends A and B of a rod 20 cm long have the temperature at 30^0 C and 80^0 until steady states prevail. The temperatures of the ends are change at 40^0C and 60^0C respectively. Find the temperature distribution in the rod at time *t*.

(14M)

7. a) Find the Fourier sine and cosine transform of $f(x) = 1 + x^{2}$.

b) Find the inverse Fourier cosine transform of $F_c(p) = p^n e^{-ap}$.

(7M+7M)

Subject Code: R161109/R16

Set No - 3

I B. Tech I Semester Regular Examinations Dec. - 2016
MATHEMATICS-II
(Mathematical Methods)
(Com. to CSE, IT, Agri Engg.)

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**
*****

PART A

1. a) Using Newton-Raphson method find reciprocal of 18.

b) The function $y = \sin x$ is tabulated below

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
$y = \sin x$	0	0.70711	1.0

Using Lagrange's interpolation formula, find the value of $\sin\frac{\pi}{6}$.

c) Solve numerically using Euler's method $y' = y^2 + x, y(0) = 1$. Find $y(0.1)$ and $y(0.2)$.

d) Express $f(x) = x$ as a Half range sine series in $0 < x < 2$.

e) Solve $u_x - 4u_y = 0, u(0, y) = 8e^{-3y}$ by the method of separation of variables.

f) Find finite Fourier cosine transform of $f(x) = x, 0 < x < 4$.

g) Using Euler's method find an approximate value of y corresponding to $x = 0.4$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ at $x = 0$. (7×2 = 14M)

PART B

2. a) Find a real root of the equation $x^3 - 4x - 9 = 0$ using False position method correct to three decimal places.

b) Solve the system of equations by Newton Raphson method $3yx^2 - 10x + 7 = 0$ and $y^2 - 5y + 4 = 0$. (7M+7M)