Subject Code: R13207/R13 **Set No - 1**

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E, Textile Engg.)

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) Using Bisection method, find a real root of $x^3 - x - 11 = 0$ upto 3 approximations.
   (b) If the interval of difference is unity, prove that $\Delta \tan^{-1}\left(\frac{n-1}{n}\right) = \tan^{-1}\left(\frac{1}{2n^2}\right)$.
   (c) Find the value of y for $x = 0.2$ by Picard's method, given that $\frac{dy}{dx} = x + y, y(0) = 3$ up to 2 approximations.
   (d) Find the Fourier sine series of $f(x) = (2 - x)^2$ in [0, 2].
   (e) If $F_S(p)$ is the Fourier sine transform of f(x), then prove that $F_S[f(ax)] = \frac{1}{a} F_S\left(\frac{p}{a}\right)$.
   (f) Find the Z-transform of $a^{-n} \cos nt$.

[4+4+4+4+4+2]

PART-B

2. (a) Find a positive root of the equation $3x = \cos x + 1$ by Newton Raphson method.
   (b) Find y(74) given that *y(50)= 201, y(60)= 225, y(70)=248 and y(80)=274.* Using Newton's difference formula.

[8+8]

3. (a) Find a real root of $\log x = \cos x$ using regula falsi method.
   (b) Using Lagrange's Interpolation formula find the value of y(10) from the following table

x	5	6	9	11
y(x)	12	13	14	16

[8+8]

4. (a) Given $y^1 = x + \sin y$, $y(0) = 1$.Compute $y(0.2)$ with h = 0.1 using modified Euler's method .
   (b) Obtain the Fourier cosine series for f(x) = sin x, $0 < x < \pi$

[8+8]

5. (a) Using Runge-Kutta fourth order formula, Find $y(0.2)$ for the equation $y^1 = \frac{y-x}{y+x}$ $y(0)=1$ taking h=0.1.

   (b) Find the Fourier series of $f(x) = \begin{cases} \frac{-1}{2}(\pi - x), \text{for } -\pi < x < 0 \\ \frac{1}{2}(\pi - x), \text{for } 0 < x < \pi \end{cases}$

[8+8]

6. (a) Find the Fourier sine and cosine transform of $f(x) = \frac{e^{-ax}}{x}$ and deduce that $\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x} \sin sx = \tan^{-1}\left(\frac{s}{a}\right) - \tan^{-1}\left(\frac{s}{b}\right)$.

   (b) Find the inverse Z – transform of $\frac{z}{(z+3)^2(z-2)}$.

[8+8]

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

   (b) Solve the difference equation using Z- transform $y(n+2)+5y(n+1)+4y(n) = 2^n$ given that $y(0) = 1$, $y(1) = -4$.

[8+8]

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Subject Code: R13207/R13 **Set No - 2**

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E, Textile Engg.)

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) Using Bisection method, find a real root of $x^3 - 6x - 4 = 0$ upto 3 approximations.
   (b) Find the second difference of the polynomial $x^4 - 12x^3 + 42x^2 - 30x + 9$.
   (c) Find the value of y for $x = 0.2$ by Picard's method, given that $\frac{dy}{dx} = x - y, y(0) = 3$ up to 2 approximations.
   (d) Find the Fourier cosine series of $f(x) = (2 - x)$ in [0, 2].
   (e) If $F_C(p)$ is the Fourier cosine transform of f(x), then prove that $F_C[f(ax)] = \frac{1}{a} F_C\left(\frac{p}{a}\right)$
   (f) Find the Z-transform of $a^{-n} \sin nt$.

[4+4+4+4+4+2]

PART-B

2. (a) Find a positive root of $x^4 - x - 9 = 0$ by Newton Raphson method.
   (b) Consider following data

X	0.1	0.2	0.3	0.4	0.5
g(x)	9.9833	4.9696	3.2836	2.4339	1.9177

And calculate approximately g(0.15) using Netown's Forward Interpolation formula

[8+8]

3. (a) Find a real root of $e^x \sin x = 1$ using regula falsi method.
   (b) Find f(2.4) from the following data using appropriate interpolation method

x	1.0	1.5	2.5	4.5
f(x)	3	3.375	5.0	12.072

[8+8]

4. (a) Given $y^1 = x - y$, $y(0) = 1$. Compute $y(0.2)$ with h = 0.1 using modified Euler's method .
   (b) Obtain the Fourier sin series for f(x) = sin x, $0 < x < \pi$

[8+8]

5. (a) Using Runge-Kutta fourth order formula, Find $y(3)$ for the equation $y^1 = \frac{x+y}{x}$ $y(2) = 2$ taking h=0.5.

   (b) Find the Fourier series, in $-\pi < x < \pi$, of $f(x) = e^{-ax}$.

   Hence deduce that

$$\frac{\pi}{\sinh\pi} = 2\left[\frac{1}{2^2+1} - \frac{1}{3^2+1} + \frac{1}{4^2+1} - \ldots\right]$$

[8+8]

6. (a) Find the Fourier transform of $f(x) = e^{-|x|}$ and deduce that $\int_0^\infty \frac{\cos xt}{1+t^2} dt = \frac{\pi}{2} e^{-|x|}$.

   (b) Find $Z\left[3^n \cos\left(\frac{n\pi}{2} + \theta\right)\right]$

[8+8]

7. (a) Prove that $F[x^n f(x)] = (-i)^n \frac{d^n[F(p)]}{dp^n}$

   (b) Solve the difference equation using Z- transform $y(n+2)+2y(n+1) + y(n) = n$ given that $y(0) = 0$, $y(1) = 0$.

[8+8]

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Subject Code: R13207/R13 **Set No - 3**

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E, Textile Engg.)

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) Using Bisection method, find a real root of $x^3 - 4x - 9 = 0$ upto 3 approximations.
   (b) Show that $e^x\left(u_0 + x\Delta u_0 + \frac{x^2}{2}\Delta^2 u_0 + \ldots\right) = u_0 + u_1 x + u_2\frac{x^2}{2} + \ldots.$
   (c) Find the value of y for $x = 0.2$ by Picard's method, given that $\frac{dy}{dx} = x + 2y, y(0) = 3$ up to 2 approximations.
   (d) Find the Fourier sine series of $f(x) = (\pi - x)^2$ in $[0, \pi]$.
   (e) If $F_S(p)$ is the Fourier sine transform of f(x), then prove that $F_S\left[f\left(\frac{x}{a}\right)\right] = aF_S(ap)$
   (f) Find the Z-transform of $a^n \cos nt$.

[4+4+4+4+4+2]

PART-B

2. (a) Find a positive root of the equation $3x = \cos x + 1$ by regula falsi method.
   (b) Find y(2) given that $y(0)= 2$, $y(6)= 2.25$, $y(7)=2.48$ and $y(8)=2.74$. Using Newton's difference formula.

[8+8]

3. (a) Find a real root of $\log x = \cos x$ using Newton Raphson method.
   (b) Using Lagrange's Interpolation formula find the value of y(10) from the following table

x	3	7	9	15
y(x)	15	17	14	22

[8+8]

4. (a) Given $y^1 = x + \sin y$, $y(0) = 1$ .Compute $y(0.2)$ with h = 0.1 using Euler's method .
   (b) Obtain the Fourier sin series for f(x) = cos x, $0 < x < \pi$

[8+8]

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5. (a) Using Runge-Kutta fourth order formula, Find y(0.2) and $y(0.4)$ for the equation $y^1 = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0) = 1$ taking h=0.2.

   (b) Find the Fourier series of $f(x) = |x|$ in the interval $(-2,2)$.

[8+8]

6. (a) Show that the Fourier transform of $f(x) = \begin{cases} a - |x| & for\ |x| < a \\ 0 & for\ |x| > a > 0 \end{cases}$ is $\sqrt{\frac{2}{\pi}}\left[\frac{1-\cos as}{s^2}\right]$.

   (b) Find Z – transform of $\frac{1}{(n+3)(n+2)}$.

[8+8]

7. (a) Express $f(x) = \begin{cases} 1 & for\ 0 \le |x| \le \pi \\ 0 & for\ |x| > \pi \end{cases}$ as Fourier sine integral and hence evaluate $\int_0^\infty \frac{1-\cos(\lambda\pi)}{\lambda}\sin(x\lambda)d\lambda$.

   (b) Solve the difference equation using Z- transform $y(n+2)-3y(n+1)+2y(n) = 0$ given that $y(0) = 0, y(1) = 1$.

[8+8]

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Subject Code: R13207/R13 **Set No - 4**

I B. Tech II Semester Regular/Supplementary Examinations May - 2016

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to CE, ME, CSE, PCE, IT, Chem E, Aero E, Auto E, Min E, Pet E, Metal E, Textile Engg.)

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) Using Bisection method, find a real root of $x^3 - 5x + 3 = 0$ upto 3 approximations.
   (b) Evaluate $\Delta^n e^{ax+b} = (e^{ah} - 1)^n e^{ax+b}$.
   (c) Find the value of y for $x = 0.2$ by Picard's method, given that $\frac{dy}{dx} = 2x - y, y(0) = 3$ up to 2 approximations.
   (d) Find the Fourier cosine series of $f(x) = \pi - x$ in [0, π].
   (e) If $F_C(p)$ is the Fourier cosine transform of f(x), then prove that $F_C\left[f\left(\frac{x}{a}\right)\right] = aF_C(ap)$
   (f) Find the Z-transform of $a^n \sin nt$.

[4+4+4+4+4+2]

PART-B

2. (a) Find a positive root of the equation $2x - \log_{10} x = 7$ by regula falsi method.
   (b) The population of a nation in the decinnial census was given below. Estimate the population in the year 1925 using appropriate interpolation formula

Year x	1891	1901	1911	1921	1931
Population y (thousands)	46	66	81	93	101

[8+8]

3. (a) Find a real root of $xe^x - \cos x = 0$ using Newton Raphson method.
   (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

[8+8]

4. (a) Given $y^1 = x + \sin y$, $y(0) = 1$. Compute $y(0.2)$ with h = 0.1 using modified Euler's method.
   (b) Obtain the Fourier cosine series for f(x) = cos x, $0 < x < \pi$.

[8+8]

5. (a) Using Runge-Kutta fourth order formula, Find y(0.1) and $y(0.2)$ for the equation $y^1 = xy + y^2, y(0) = 1$ taking h=0.1.
   (b) Find the Fourier series of $f(x) = e^x$ in the interval $(0,2\pi)$.

[8+8]

6. (a) Find the inverse Fourier transform f(x) of $F(p)=e^{-|p|y}$.
   (b) Find Z – transform of. $e^k \sin k\alpha$ $(k \geq 0)$.

[8+8]

7. (a) Express $f(x) = \begin{cases} 1 & for\ 0 \leq |x| \leq \pi \\ 0 & for\ |x| > \pi \end{cases}$ as Fourier sine integral and hence evaluate $\int_0^\infty \frac{1-\cos(\lambda\pi)}{\lambda}\sin(x\lambda)d\lambda$.

   (b) Solve the difference equation using Z- transform $y(n+2)-6y(n+1)+9y(n) = 3^n$ given that y(0) = 0, y(1) = 1.

[8+8]

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