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

I B. Tech II Semester Regular Examinations August - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

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

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.(i) Write iterative scheme to find the n^{th} root of a real number K(>0).

(ii) Find $\Delta \log f(x)$.

(iii) Find half range Fourier sine series of f(x) = e^x in (0, 1).

(iv) Prove that $Z(\sinh nt) = \dfrac{z \sinh t}{z^2 - 2z\cosh t + 1}$.

(v) Using Euler's method, find the value of y(0.5) (take h = 0.25) and compare with the exact solution of the equation $y' = x + y,\ y(0) = 1$

(vi) If F_p is complex Fourier transform of f(x), then find the complex Fourier transform of f(x) sin ax.

[3+3+3+3+5+5]

PART – B

2.(a) Using Newton-Raphson method find the root of the equation $x+log_{10}x = 3.375$ correct to four decimal places.

(b) The population of a town in the decimal census is given below. Estimate the population of a town for the year 1895

Year X	1971	1981	1991	2001	2011
Population Y	146	166	181	193	201

[8+8]

3.(a) Find positive root of $x^3 - 5x + 3 = 0$ using Regula falsi method up to 4 steps.

(b) Using Lagrange's interpolation formulae find the value of y (12) from the data

X	5	7	9	13
Y	11	13	18	27

[8+8]

4.(a) Solve $y' = x^2 y + 1$, y(0)=1 using Taylors method up to 3rd degree term and compute y(0.1).

(b) Find the fourier series of $f(x) = x \sin x$ in $(-\pi, \pi)$.

[8+8]

5.(a) Find half range cosine series of $f(x) = \begin{cases} 1, & 0 < x < \frac{\pi}{2} \\ -1, & \frac{\pi}{2} < x < \pi \end{cases}$.

(b) Use Runge-Kutta 4th to compute y(1.25) given that $\frac{dy}{dx} = \frac{x^2 + y}{x}$, $y(1) = 2$

[8+8]

6.(a) Find Fourier transform $f(x) = \begin{cases} x \ if \mid x \mid \leq 1 \\ 0 \ if \mid x \mid > 1 \end{cases}$.

(b) Find Z-transform of $n\ a^n$.

[8+8]

7.(a) Find Fourier sine transform of e^{-x} and hence deduce the inversion formula.

(b) Solve the difference equation $u_{n+2} - u_n = 2^n$, $u_0 = 0$, $u_1 = 1$, using Z- transforms.

[8+8]

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

I B. Tech II Semester Regular Examinations August - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

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

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.(i) Using bisection method find the first four approximations to the real root of $3x = e^x$.

(ii) Prove that $\Delta(\frac{1}{f(x)}) = \frac{-\Delta f(x)}{f(x)f(x+1)}$.

(iii) If $Z(n^2) = \frac{z^2+z}{(z-1)^3}$ find $Z(n^3)$.

(iv) Find the Half range Fourier sine series of f(x) = |x| in (0, 1).

(v) If $y' = 2x - y,\ y(1) = 3$, find the solution, up to third degree term, using Picard's method.

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

[3+3+3+3+5+5]

PART – B

2.(a) Using Newton – Raphson method, find a root of the equation $2x - 3\sin x = 5$ near x=5 correct to three decimal places.

(b) Given that f(6500) = 80.8084, f(6510) = 80.6846, f(6520) = 80.7456, f(6530) = 80.8084, find f(6526) using Gauss backward interpolation formula.

[8+8]

3.(a) Find a positive root of $2x = 3 + \cos x$ by using Newton-Raphson method correct to three decimal places. (Use Bisection method for the first approximation).

(b) Using Lagrange's Interpolation formula for the value of $y(6)$ given the following table

X	1	2.5	5	7
Y	2.25	4.13	7.25	9.0

[8+8]

4.(a) Solve $y' = y + x$, $y(0) = 1$ using Picard's method up to third approximation and hence find the value of y(0.1).

(b) Find the Fourier expansion of $f(x) = x\cos x,\ 0 < x < 2\pi$.

[8+8]

5.(a) Find half range cosine series of $f(x) = \begin{cases} 1, & 0 < x < 1 \\ -1, & 1 < x < 2 \end{cases}$.

(b) Find y(0.1) using 4th order Runge-Kutta method given that $y' = x + x^2 y,\ y(0) = 1$.

[8+8]

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

(b) Find Z-transform of $n^2 e^{n\theta}$.

[8+8]

7.(a) Find Fourier cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$.

(b) Solve $y(n+2)+3y(n+1)+2y(n)=0,\ y(0)=0, y(1)=1$ using Z-Transform.

[8+8]

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

I B. Tech II Semester Regular Examinations August - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

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

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.(i) Find reciprocal of a real number 19 using Regula falsi method.

(ii) Expand the shift operator E in terms of exponential function.

(iii) Employ Taylor's method to obtain the values of y(1.1) for the differential equation $y' = xy^{1/3}, y(1) = 1$.

(iv) A sinusoidal voltage $E\cos\omega t$ is passed through a half wave rectifier which clips the negative portion of the wave. Develop the resulting periodic function

$$u(t) = \begin{cases} 0 & , -\frac{T}{2} < t < 0 \\ E\cos\omega t, & 0 < t < \frac{T}{2} \end{cases}, T = \frac{2\pi}{\omega}$$ as Fourier series.

(v) Prove that $F_s\left[\frac{d}{dx}F(x)\right] = -pF_c(p)$

(vi) Find the Z-transform of $\sin((n+1)t)$.

[3+3+3+5+3+5]

PART – B

2.(a) By using Regula-Falsi method for a real root of $xe^x = 2$ up to 4 stages.

(b) Using a forward difference formula, find y(11)from the given table

X	1	6	11	16	21	26
Y	5	10	14	18	24	32

[8+8]

3.(a) Using Newton-Raphson formula, find the root of $e^x - x^3 + \cos 25x = 0$ around x= 4.5 correct to 3 decimal places.

(b) Using Lagrange's Interpolation formula, find the value y(2) given the following table of values

X	1	1.1	1.4	1.8
Y	2	4	8	11

[8+8]

4.(a) Using Euler's method, solve for y (0.6) from $y' = -2xy$, $y(0) = 1$ using step size 0.2.

(b) Find the Fourier series of $f(x) = \begin{cases} 0 & , -\pi < x < 0 \\ \dfrac{\pi}{4}, & 0 < x < \pi \end{cases}$.

[8+8]

5.(a) Represent the function as Fourier cosine series $f(x) = \begin{cases} \dfrac{\pi}{2} & , 0 < x < \dfrac{\pi}{2} \\ \pi - x, & \dfrac{\pi}{2} < x < \pi \end{cases}$.

(b) Use Runge-Kutta 4th order to compute y(1.2) for the equation $y' = \dfrac{x^2 + y}{x}, y(1) = 2$.

[8+8]

6.(a) Find the Fourier cosine transform of $\dfrac{e^{-ax}}{x}$.

(b) Find $Z^{-1}\left[\dfrac{8z - z^3}{(4-z)^3}\right]$.

[8+8]

7.(a) Find Fourier cosine transform of $f(x) = \begin{cases} x & if\ |x| \le a \\ 0 & if\ |x| > a \end{cases}$.

(b) Solve $u_{n+2} - 6u_{n+1} + 9u_n = 0$ using Z-transform.

[8+8]

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

I B. Tech II Semester Regular Examinations August - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

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

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.(i) Evaluate $\sqrt[4]{29}$ to four decimal places by Newton-Raphson method.

(ii) If the interval of differencing is unity, find $\Delta^2 \sin(px+q)$.

(iii) Using Taylor's series method obtain y(0.2) for the differential equation $y' + 2y = 3e^{2x}, y(0) = 0$.

(iv) Find the Fourier series of $f(x) = |\cos x|$ in $(-\pi, \pi)$.

(v) Find Fourier transform of $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$.

(vi) Prove that $Z(\cos nt) = \dfrac{z(z - \cos t)}{z^2 - 2z\cos t + 1}$.

[3+3+3+3+5+5]

PART – B

2.(a) Find a real root of $x^3 - 4x - 9 = 0$ using Bisection method up to 4 stages.

(b) Using Gauss Backward difference polynomial, find y(5) given that

X	0	4	6	8	10
Y	5	11	13	15	17

[8+8]

3.(a) Using Newton-Raphson method, find a positive root of $\cos x - x e^x = 0$ up to four decimal places.

(b) Using Lagrange's Interpolation, find f(12), given that

X	3	7	9	13
Y	5	12	13	21

[8+8]

4.(a) Using Euler's method, solve for y (0.4) from $y' = 2xy$, $y(0) = 1$ using step size 0.2.

(b) Find the Fourier series of periodicity 2 for $f(x) = x + x^2$ in 0 < x < 2.

[8+8]

5.(a) Represent the function as Fourier sine series $f(x)=\begin{cases}\frac{\pi}{2}, & 0<x<\frac{\pi}{2}\\ \pi-x, & \frac{\pi}{2}<x<\pi\end{cases}$.

(b) Estimate y(0.2), given $y'=3x+y, y(0)=1$ using Runge-Kutta 4th order.

[8+8]

6.(a) Find Fourier cosine transform of $\frac{e^{-ax}}{x}$.

(b) Find the Z-transform of $\{x(n)\} = n z^n$

[8+8]

7.(a) Find Fourier transform of $f(x)=\begin{cases}\frac{1}{2a}, & |x|\le a\\ 0, & |x|>a\end{cases}$.

(b) Solve $u_{n+2}-u_n = 2^n, u_0=0, u_1=1$ using Z-transform.

[8+8]