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

I B. Tech II Semester Regular/Supply Examinations July - 2015

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.(a) Define Rate of convergence and what is the rate of convergence of bisection and iteration methods

(b) Find $\Delta f(x)$ if $f(x)=\dfrac{2x+1}{x(x+1)}$ by taking h =1

(c) Write the merits and demerits of Taylor's Method

(d) Find the Fourier series of f(x) = sinax in $(-\pi, \pi)$

(e) Find the Fourier cosine transform of f(x) = 1 in (0, 2)

(f) Find $Z^{-1}\left[\dfrac{z^2}{z^2+1}\right]$

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

PART-B

2.(a) Find the real root of $x+\log_{10} x-2=0$ using Newton Raphson method

(b) Find the positive root of the equation $x^3-9x+1=0$ by Bisection Method

[8+8]

3.(a) Compute $y^1(4)$ from following table

X	1	2	4	8	10
Y	0	1	5	21	27

(b) Find by Gauss's Backward interpolating formula the value of *y* at *x*=1936, using the following table:

x	1901	1911	1921	1931	1941	1951
y	12	15	20	27	39	52

[8+8]

4.(a) Find y(2) and y(3) by Picard's method given that $\dfrac{dy}{dx}=2x-y,\ y(1)=3.$

(b) Using Modified Euler's method of fourth order evaluate y(0.1) and y(0.2) given that $y^1=x+y, y(0)=1$.

[8+8]

5.(a) Obtain the Fourier series for the function f(x) given by $f(x)=\begin{cases} -x(x+\pi); -\pi \le x \le \pi \\ x(x+\pi); 0 \le x \le \pi \end{cases}$

(b) Obtain the Fourier series expansion of f(x) given that $f(x)=(\pi-x)^2$ in $0<x<2\pi$ and Deduce the value of $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+---------=\frac{\pi^2}{6}$.

[8+8]

6.(a) Find the Fourier cosine transform of $f(x)=\begin{cases} \cos x \; if \; |x|<a \\ 0 \; if \; |x|>a \end{cases}$

(b) Find the finite Fourier sine and cosine transforms of $f(x)=e^{-ax}$ in $(0,L)$

[8+8]

7.(a) Find $Z^{-1}\left(\frac{2z}{z^3-z^2+z-1}\right)$

(b) If $F(z)=\frac{5z^2+3z+12}{(z-1)^4}$; then find the values of f(2) and f(3)

[8+8]

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

I B. Tech II Semester Regular/Supply Examinations July - 2015

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.(a) Write the working rule to find the root of the equation by bisection method

(b) Evaluate the expression $(1+\Delta)(1-\nabla)$

(c) Write the merits and demerits of Euler's Method

(d) Find the Fourier series of f(x) = cosax in (-L, L)

(e) Find the Fourier sine transform of f(x) = 1 in $(0,\pi)$

(f) Find $Z^{-1}\left[\frac{z^2}{(z-a)(z-b)}\right]$ using convolution theorem

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

PART-B

2.(a) Find the positive root of the equation x^3-5x-7=0 by False position method

(b) Find the positive root of the equation e^x-3x = 0 by Newton Raphson method

[8+8]

3.(a) Find f(2.5) from the following table

x	1.6	1.8	2.0	2.2	2.4	2.6
y	4.95	6.05	7.39	9.03	11.02	13.46

(b) Using Lagrange's formula, calculate $f(3)$ from the table:

x	0	1	2	4	5	6
$f(x)$	1	14	15	5	6	19

[8+8]

4.(a) Using Taylor's series method: Solve $y' = xy + y^2, y(0) = 1\ at\ x = 0.1, 0.2, 0.3$

(b) Solve: $y' = y - x$, $y(0) = 2$, $h = 0.2$ find y (0.2), using R- K method.

[8+8]

5.(a) Develop the Fourier series of $f(x)=\begin{cases} 2; -2\le x\le 0 \\ x; 0\le x\le 2 \end{cases}$

(b) If $f(x)=|\cos x|$; Expand f(x) as a Fourier series in the interval $(-\pi, \pi)$

[8+8]

6.(a) Find Fourier Sine transform $f(x)=\dfrac{1}{\left(x^2+1\right)}$

(b) Express the function $f(x)=\begin{cases} 0; x<0 \\ \dfrac{1}{2}; x=0 \\ e^{-x}; x>o \end{cases}$ as a Fourier integral.

[8+8]

7.(a) Solve the difference equation $y_{n+2}-2y_{n+1}+y_n=3n+5\ \ if\ \ y_0=1, y_1=-4.$ by Z –transforms

(b) Find the Z- transform of the following $(i) n^2e^{-an}$ (ii) $(n+1)^2$ (iii) $a^n\sin(nt)$

[8+8]

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

I B. Tech II Semester Regular/Supply Examinations July - 2015

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.(a) Write the working rule to find the root of the equation by Newton Raphson method

(b) Find $\left(\frac{\Delta^2}{E}\right)x^3$

(c) Write the working rule to solve the $y^1 = f(x,y)\ y(x_0) = y_0$ by Picard's method

(d) Find the half range sine series of f(x) = 2x in (0, L)

(e) Find the Fourier transform of f(x) = 1 in (-1, 1)

(f) Find $Z\left[\sin(n+1)\theta\right]$ using shifting theorem

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

PART-B

2.(a) Find the root of the equation:$x^3 = 2x + 5$ by iteration method.

(b) Find the real root for $xe^x = 2$ by using Regula – Falsi method.

[8+8]

3.(a) Using Lagrange's formula fit a polynomial to the following data

x	0	1	4	5
y	4	3	24	39

(b) Estimate f(1.75) from the following table using Newton forward interpolation formula

x	1.7	1.8	1.9	2.0
y	5.474	6.050	6.686	7.389

[8+8]

4.(a) Using Runge Kutta method of fourth order evaluate y(0.1) and y(0.2) given that $y^1 = x + y, y(0) = 1$

(b) Apply Taylor series methods to find y(1.1), y(1.2) correct to 3 decimal places, given

$\frac{dy}{dx} = xy^{1/3}$, y(0)=1.

[8+8]

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5.(a) Obtain the Fourier series of f(x) = $\sqrt{1-\cos x}$ in (-π, π)

(b) Expand $f(x)=\begin{cases}\frac{1}{4}-x; 0\le x\le 1/2\\ x-\frac{3}{4}; 1/2\le x\le 1\end{cases}$ as a Fourier series of sine terms.

[8+8]

6.(a) Find Fourier transform of $f(x)=e^{-a|x|}$ (a>0) and hence show that

$$\int_0^\infty \frac{\cos(sx)}{a^2+s^2}ds=\frac{\pi}{2a}e^{-a|x|}$$

(b) Find the finite Fourier cosine transform of

$i) f(x)=\frac{x^2}{2\pi}-\frac{\pi}{6}$, $0\le x\le \pi$ $ii) f(x)=x, 0<x<4$

[8+8]

7.(a) Using Z- Transform solve $y_{n+1}+2y_{n+1}+y_n=n$; Given that $y_0=y_1=0$;

(b) Using $Z(n^2)=\frac{z^2+z}{(z-1)^3}$ prove that $Z((n+1)^2)=\frac{z^3+z^2}{(z-1)^3}$

[8+8]

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

I B. Tech II Semester Regular/Supply Examinations July - 2015

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.(a) What is mean by quadratic convergence and derive the convergence condition for Newton Rapson method.

(b) Find Δf(x) if f(x) = $f(x) = \frac{1}{(x^2+5x+6)}$ by taking h =1

(c) Write the working rule to solve the $y^1 = f(x,y)$ $y(x_0) = y_0$ by RK method of third order

(d) Find the half range cosine series of f(x) = x in (0, π)

(e) Find the Finite Fourier cosine transform of f(x) = 1 in (0, π)

(f) Find $Z\left[\cos(n+1)\theta\right]$ using shifting theorem

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

PART-B

2.(a) Evaluate $\sqrt{12} and \frac{1}{\sqrt{12}}$ by the fixed point iteration method.

(b) Find a root correct to 3decimal places for the equation $x^3 - 4x + 9 = 0$ using Bisection method

[8+8]

3.(a) Certain values of x and $\log_{10}^{x}$ are (300,2.4771),(304,2.4829),(305,2.4843),(307,2.4871). Find $\log_{10}^{301}$

(b) Using Lagrange's Interpolation formula evaluate y(6).

x	3	5	7	9	11
y	6	24	58	108	74

[8+8]

4.(a) Given $\frac{dy}{dx} - \sqrt{xy} = 2$ and y(1)=1 .Find the value of y(1.5) in steps of 0.25 using Euler's modified method.

(b) Use Runge-Kutta method to solve $\frac{dy}{dx} = xy + y^2, y(0) = 1$ for y(0.1) and y(0.2).

[8+8]

5.(a) Obtain Fourier series for the function f(x) given by $f(x)=\begin{cases}1+\frac{2x}{\pi}, -\pi \le x \le 0\\ 1-\frac{2x}{\pi}, 0 \le x \le \pi\end{cases}$

and deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+............=\frac{\pi^2}{8}$

(b) If $f(x)=\begin{cases}x; 0<x<\pi/2\\ \pi-x; \pi/2<x<\pi\end{cases}$

Show that $f(x)=\frac{\pi}{4}-\frac{2}{\pi}\left[\frac{1}{1^2}\cos 2x+\frac{1}{3^2}\cos 6x+\frac{1}{5^2}\cos 10x+-------\right]$

[8+8]

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

Hence deduce that $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 = \frac{\pi}{2}$

(b) Find the finite Fourier sine transform of f(x) defined by $f(x)=\left(1-\frac{x}{\pi}\right)^2$ where 0<x<π

[8+8]

7.(a) Solve the difference equation $y_{n+2}-2y_{n+1}+y_n=2^n$ if $y_0=2, y_1=1$. by Z –transforms

(b) Find $Z^{-1}\left[\frac{z^3}{(z-3)(z^2+1)}\right]$ using the convolution theorem.

[8+8]

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