Subject Code: R13107/R13 **Set No - 1**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, ECom E and Agri.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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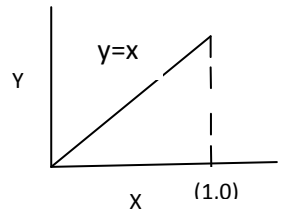
PART-A

1.(a) Write iterative scheme to find the *fourth root* of 11.

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

(c) Given $y' = x + y,\ y(0) = 1$, find the value of y (0.4) (take h = 0.2) using Euler's method.

(d) Find the Fourier series of the periodic function with period '1'



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

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

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

PART – B

2.(a) Using Regulae falsi method ,find the real root correct to three decimal places of the equation $xe^x - 2 = 0$.

(b) Find f(2.5) using Newton's forward formulae for the following data:

X	0	1	2	3	4	5
y	0	1	15	75	225	615

[8+8]

3.(a) If the interval of differencing is $\frac{1}{2}$ find $\Delta^2 \sin(px + q)$

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

[8+8]

4.(a) Solve $y^1 = x - y^2, y(0) = 1$ by using Taylor's series method and compute $y(0.1)$.

(b) Find Half range fourier cosine series of $f(x) = x$ in the range $0 < x < 2\pi$ and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

[8+8]

5.(a) Obtain fourier series for the function $f(x) = x\sin x\ , 0 < x < 2\pi$.

(b) Solve $y^1 = y - x, y(0) = 2$ for $x = 0.2$ by using Runge-Kutta Method of fourth order.

[8+8]

Subject Code: R13107/R13 **Set No - 1**

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

(b) Find inverse Z-transform of $\frac{Z}{(Z-1)(Z-2)}$.

[8+8]

7.(a) Solve the difference equation using Z-transform $y(n+2) - 5y(n+1) + 6y(n) = 5^n$, given $y(0) = 0\,, y(1) = 0$.

(b) Find inverse fourier transform of $F(p) = e^{-|p|y}$.

[8+8]

Subject Code: R13107/R13 **Set No - 2**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

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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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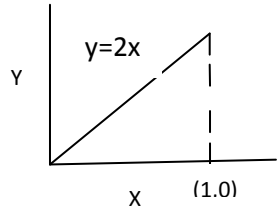
PART-A

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

(b) Find $\Delta^2 \sin(px+q)$.

(c) Find the Fourier series of the periodic function with period '1'



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

(e) Find the Z-transform of *sin(n+1)x.*

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

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

PART – B

2.(a) Using Regula-Falsi Method, find the real root of, correct to three decimal places, the equation $\log x = \cos x$.

(b) Find $y(1.91)$ using Gauss forward difference formula

x	1	2	3	4	5
y	5	14.5	14	13.25	12

[8+8]

3.(a) If $f(x) = e^{ax}$, Show that $\Delta^n f(x) = (e^{ah} - 1)^n e^{ax}$.

(b) Find the root of $e^x - x^3 + \cos 25x = 0$ near x = 4.5 (correct to three decimal places).

[8+8]

4.(a) Solve $y' = y - x^2, y(0) = 1$ by Picard's method up to fourth approximation.

(b) Find a Fourier series to represent the function $f(x) = e^x$ in $-\pi < x < \pi$ and hence deduce a series for $\frac{\pi}{\sinh \pi}$

[8+8]

Subject Code: R13107/R13 **Set No - 2**

5.(a) Find Half Range sine series of $f(x) = x(\pi - x)$ on $0 < x < \pi$ and deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \ldots = \frac{\pi^3}{32}$.

(b) Using Runge-Kutta method of 4th order, compute y (1.1) for the equation $y' = 3x + y^2, y(1) = 1.2$.

[8+8]

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

(b) Find $Z\left(\frac{1}{n(n+1)}\right)$.

[8+8]

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

(b) Find Fourier cosine transform of $e^{-ax}, a > 0$ and hence evaluate $\int_0^\infty \frac{\cos px}{a^2 + p^2} dp$.

[8+8]

Subject Code: R13107/R13 **Set No - 3**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, ECom E and Agri.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**

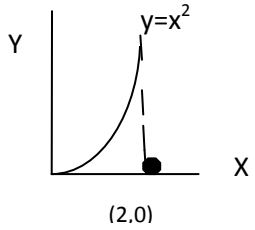
*****

PART-A

1.(a) Write iterative scheme to find the root of the quadratic equation $ax^2 + bx + c = 0, a \neq 0$.

(b) Prove that $E^{1/2} = \mu + \frac{1}{2}\delta$

(c) Find the Fourier series of the periodic function (of period 2) given by



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

(e) Given $y' = x + y$, $y(0) = 1$, find the value of y(0.4) using Picard's method up to second degree term.

(f) Find the Z-transform of *cos(n+1)x*.

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

PART – B

2.(a) Using Regula Falsi method solve the equation $e^x sinx = 1$.

(b) Using Lagrange's interpolation formula find $y(10)$ from the data given below:

X	5	6	9	11
y	12	13	14	15

[8+8]

3.(a) Prove that $\nabla\Delta = \Delta - \nabla = \delta^2$.

(b) Find approximate root of the equation $x^3 - 8x - 4 = 0$ near 3.

[8+8]

4.(a) Given $y^1 = \frac{y-x}{y+x}$, $y(0) = 1$ compute $y(0.2)$ in steps of 0.1 using modified Euler's method.

(b) If $f(x) = |x|$ expand $f(x)$ as fourier series in the interval$(-2,2)$.

[8+8]

Subject Code: R13107/R13 **Set No - 3**

5.(a) If $f(x) = \begin{cases} x & ; if\ 0 < x < \frac{\pi}{2} \\ \pi - x & ; if\ \frac{\pi}{2} < x < \pi \end{cases}$ Find Half range sine series of $f(x)$.

(b) Using Runge-Kutta method of fourth order, compute $y(2.5)$ for the equation $y^1 = \frac{x+y}{x}$, $y(2) = 2$.

[8+8]

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

(b) Evaluate $Z^{-1}\left[\frac{Z^2}{(Z-3)(Z-4)}\right]$

[8+8]

7.(a) Find finite Fourier cosine transform of $f(x) = \left(1 - \frac{x}{\pi}\right)^2$ in $(0, \pi)$.

(b) Using Z-transform, solve the difference equation $y_{n+2} - 5y_{n+1} - 6y_n = 2^n$ using $y_0 = 0, y_1 = 0$.

[8+8]

Subject Code: R13107/R13 **Set No - 4**

I B. Tech I Semester Regular Examinations Jan./Feb. - 2015

MATHEMATICS-II (MATHEMATICAL METHODS)

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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**

*****

PART-A

1.(a) Using Newton-Raphson method find the reciprocal of a number.
(b) Express shift operator E in terms of exponential function.
(c) Find half range Fourier sine series of $f(x) = e^x$ in (0, 1).
(d) Using Euler's method, solve for y at x = 2 from $\frac{dy}{dx} = 3x^2 + 1$, y(1) = 2.
(e) If F_p is complex Fourier transform of f(x), then find the complex Fourier transform of f(x) sin ax.
(f) Find the Z [$n^2 a^n$].

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

PART–B

2.(a) Using Regulae falsi method find approximate root of the equation $x^3 - x - 4 = 0$.
(b) Find $f(3.5)$ using Newton's forward interpolation formula for the data :

X	0	1	2	3	4	5
y	0	1	12	60	150	225

[8+8]

3.(a) Prove that $(1 + \Delta)(1 - \nabla) = 1$.
(b) Using Newton Raphson method compute $\sqrt[3]{37}$ correct to four decimal places.

[8+8]

4.(a) Using Euler's method solve $y^1 = x + y$, $y(0) = 1$ for $x = 0.2$ and 0.4 , Check with exact solution.
(b) Expand $f(x) = \begin{cases} 1 + \frac{2x}{\pi}; & if \ -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}; & if \ 0 \le x \le \pi \end{cases}$ as a fourier series and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

[8+8]

5.(a) Obtain fourier cosine series for $f(x) = xsinx$; $0 < x < \pi$.
(b) Using Runge-Kutta method of fourth order find $y(0.4)$ for the differential equation $y^1 = x^2 + y^2, y(0) = 0$ use $h = 0.2$

[8+8]

Subject Code: R13107/R13 **Set No - 4**

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

(b) Find $Z\left[2n - 5\sin\frac{n\pi}{4} + 3a^4\right]$.

[8+8]

7.(a) Find the solution of the difference equation using Z-transform $y_{n+2} - 6y_{n+1} + 9y_n = 3^n$ with $y_0 = 0\,, y_1 = 1$.

(b) Find fourier transform of $f(x) = \begin{cases} 1 - x^2; & |x| \le 1 \\ 0\,; & |x| > 1 \end{cases}$

[8+8]