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

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE, 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.(i) Write the sufficient condition for the convergence of Newton-Raphson method?

(ii) Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$?

(iii) Write the merits and demerits of Euler Modified method?

(iv) Write the Dirichlet's conditions of f(x)?

(v) State Initial and Final value theorems of Z-transforms?

(vi) Write the statement of Fourier integral theorem?

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

PART- B

2.(a) Using Runge-Kutta method of fourth order solve
$y' = xy,\ y(1) = 2\ at\ x = 1.2\ with\ h = 0.2.$

(b) Find the Fourier transform of $f(x) = x^{n-1}$

[8+8]

3. For the following data estimate f (1.720) using forward, f (2.68) using backward and f (2.36) using central difference formula.

x	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0
f(x)	0.0495	0.0605	0.0739	0.0903	0.1102	0.1346	0.1644	0.2009

[16]

4.(a) Solve the differential equation $\frac{dy}{dx} = x + y$ subject to $y(0) = 1$ by Picard's method and hence find $y(0.2)$.

(b) Using Regula Falsi method find a real root of $f(x) = 2x^7 + x^5 + 1 = 0$ correct upto two decimal places.

[8+8]

5.(a) Find the Fourier series for $f(x) = 2lx - x^2\ in\ (0, 2l)$, hence show that
$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ \ldots\ = \frac{\pi^2}{12}$

(b) Find the inverse Z transform of $\frac{3z^2+z}{(5z-1)(5z-2)}$

[8+8]

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6.(a) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2, |x| < 1 \\ 0, \quad |x| > 1 \end{cases}$

(b) Find a real root of $f(x) = x + \log x - 2$ using Newton-Raphson method.

[8+8]

7.(a) Find Z-transform of $(i)\ an^2 + bn + c \quad (ii) \sin\ (3n + 5)$

(b) Find the half range Fourier sine series for $f(x) = x\ in\ (0, \pi)$?

[8+8]

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

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE, 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.(i) State Intermediate Value theorem?
(ii) Show that$\Delta(e^{ax}\log bx)$?
(iii) Write the second order Runge-Kutta formula?
(iv) Give any one application of Fourer Series with example?
(v) State the convolution theorem of inverse Z-transforms?
(vi) Write the formulas Fourier cosine and sine transform?

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

PART- B

2.(a) Using modified Euler's method to find the value of y at x = 0.2 with h = 0.1 where $y' = 1 - y,\ y(0) = 0$

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

[8+8]

3.(a) Prove the relation $\sum_{k=0}^{n-1} \Delta^2 f_k \equiv \Delta f_k - \Delta f_0$

(b) Use Lagrange's interpolation formula to calculate f(3) from the following table.

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

[4+12]

4.(a) Solve the differential equation $\frac{dy}{dx}$ =x^{2}y subject to $y(0)$ =1 by Taylor series method and hence find y(0.1), $y(0.2)$.

(b) Using bisection method find a root of $f(x) = x - \cos x = 0$.

[8+8]

5.(a) Obtain the Fourier series for $f(x) = |x|\ in\ [-\pi, \pi]$, hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$

(b) Solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n\ \ with\ u_0 = 0; u_1 = 1$ using Z transforms

[8+8]

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

6.(a) Using Fourier integral, prove that $e^{-ax} = \frac{2a}{\pi}\int_0^\infty \frac{\cos ax}{a^2+\alpha^2} d\alpha, \quad a > 0, x > 0$

(b) Find a real root of $f(x) = xlog_{10}x = 1.2$ using Newton-Raphson method.

[8+8]

7.(a) Find the Z transform of $(i)\cos(n+1)\theta \qquad (ii)\sin h\ \frac{n\pi}{2}$

(b) Obtain the Fourier series for spectrum of a periodic function with example?

[8+8]

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

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MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE, 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.(i) Write the sufficient condition for the convergence of Newton-Raphson method?

(ii) Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$?

(iii) Write the advantages & disadvantages of Taylor series method?

(iv) Write the Fourier series when the given function f(x) is an even?

(v) Write the properties of multiplication by n and division by n of Z-transforms?

(vi) Write the complex form of Fourier integral theorem?

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

PART- B

2.(a) Using iteration method find a real root of $f(x) = x^2 - 3x + 1$ correct upto three decimal places starting with x=1.

(b) Solve $u_{n+2} - 2u_{n+1} + u_n = 3n + 5$ using Z-Transforms?

[8+8]

3.(a) Evaluate $\Delta(e^{ax} \log bx)$

(b) By using Lagrange's interpolation formula, fit a polynomial data

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

[4+12]

4.(a) Using modified Euler method solve numerically the equation $\frac{dy}{dx} = 2 + \sqrt{xy}$ with $y(1) = 1$ to find $y(1.2)$

(b) Find f(x) if its Fourier sine transform is $\frac{s}{1+s^2}$

[8+8]

5.(a) Obtain the Fourier series for $f(x) = (\pi - x)^2 \; in \; 0 < x < 2\pi$, hence deduce that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots = \frac{\pi^2}{6}$

(b) Using convolution theorem, evaluate $Z^{-1}[\frac{z^2}{z^2-4z+3}]$

[8+8]

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

6.(a) Using Parseval's identities, prove that $\int_0^{\infty} \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$

(b) Using Runge-Kutta method of third order, find the values of $y(x) for\ x = 0.1, 0.2$ where $y' = x - 2y,\ y(0) = 1.$

[8+8]

7.(a) Find the half range sine series for $f(x) = x(\pi - x)\ in\ (0, \pi)$

(b) Find a real root of $f(x) = x^3 - 19$ correct upto three decimal places using Newton-Raphson method

[8+8]

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

I B. Tech I Semester Regular Examinations Feb./Mar. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE, 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.(i) Show that $\mu\delta = \frac{1}{2}(\Delta + \nabla)$?

(ii) Write the merits and demerits of Iteration method?

(iii) Write the merits and demerits of Euler Modified method?

(iv) Write the Dirichlet's conditions of f(x)?

(v) State convolution theorem of Z-transforms?

(vi) Write the statement of Fourier integral theorem?

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

PART- B

2.(a) Find the Fourier sine and cosine transforms of $(2.e^{-5x} + 5.e^{-2x})$.

(b) Given $f(x) = \begin{cases} 1-x, & -\pi \le x \le 0 \\ 1+x, & 0 \le x \le \pi \end{cases}$

Is the function even or odd? Find the Fourier series for f(x).

[8+8]

3.(a) Prove the relation between *E* and *D*?

(b) For the following data estimate K (0.25) using backward difference formula.

m	0.20	0.22	0.24	0.26	0.28	0.30
K(m)	1.659624	1.669850	1.680373	1.691208	1.702374	1.713889

[4+12]

4.(a) Solve the differential equation $\frac{dy}{dx} = 1 + xy$ subject to $y(0) = 1$ by Taylor series method and hence find $y(0.2)$.

(b) Solve the difference equation $y_{n+2}+3y_{n+1}+2y_n = 0$, $y_0 = 1$, $y_1 = 2$ by z – transform.

[8+8]

5.(a) Find the Fourier series of $f(x) = x + x^2, -\pi < x < \pi$ and hence deduce the series

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \ldots\ldots = \frac{\pi^2}{12}$$

(b) Apply Runge - Kutta Method to find $y(0.1)$ and $y(0.2)$ where $\frac{dy}{dx} = x^2 - y$ and $y(0) = 1$.

[8+8]

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

6.(a) Find the Fourier transform of $e^{-|x|}$

(b) Using Regula Falsi method find a real root of $f(x) = 2x^7 + x^5 + 1 = 0$ correct upto two decimal places.

[8+8]

7.(a) Find $z(\frac{1}{n!})$ and hence evaluate $z\left(\frac{1}{(n+1)!}\right)$ and $z\left(\frac{1}{(n+2)!}\right)$

(b) Find a real root of $f(x) = x + \log x - 2$ using Newton-Raphson method.

[8+8]