Code No: R05010202 **Set No. 1**

I B.Tech Regular Examinations, Apr/May 2007
MATHEMATICAL METHODS
(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find a real root of xe^x-cosx=0 using Newton Raphson method

   (b) Using Gauss backward difference formula find y(8) from the following table

x	0	5	10	15	20	25
y	7	11	14	18	24	32

[8+8]

2. (a) Fit a parabole of the form y=a+bx+cx^2 to the following data.

x	1	2	3	4	5	6	7
y	23	5.2	9.7	16.5	29.4	35.5	54.4

   (b) The table below shows the temperature f(t) as a function of time

t	1	2	3	4	5	6	7
f(t)	81	75	80	83	78	70	60

   Use Simpson's 1/3 method to estimate $\int_1^7 f(t)dt$ [8+8]

3. Find y(.2) using picards method given that $\frac{dy}{dx} = xy, y(0)$ taking h=.1 [16]

4. (a) Prove that the following set of equations are consistent and solve them.

$$3x + 3y + 2z = 1$$
$$x + 2y = 4$$
$$10y + 3z = -2$$
$$2x - 3y - z = 5$$

   (b) Find an LU decomposition of the matrix A and solve the linear system AX=B.

$$\begin{bmatrix} -3 & 12 & -6 \\ 1 & -2 & 2 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -33 \\ 7 \\ -1 \end{bmatrix}$$ [8+8]

5. Verify Cayley Hamilton theorem and hence find A^{-1},$A = \begin{bmatrix} 7 & 2 & -2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$ [16]

6. (a) Prove that the eigen values of a real symmetric matrix are real
   (b) Reduce the quadtatic form $7x^2$+$6y^2$+$5z^2$-4xy-4yz to the canonical form[6+10]

7. (a) Find the half range cosine series for the function $f(x) = (x-1)^2$ in the interval $0 < x < 1$ Hence show that $\sum\limits_{\mathrm{n}=1}^{\infty} \frac{1}{(2\mathrm{n}-1)^2} = \frac{\pi^2}{8}$
   (b) [10+6]

8. (a) Form the partial differential equation by eliminating the arbitrary functions from $z = xf_1(x+t) + f_2(x+t)$.
   (b) Solve the partial differential equation $p^2x^4 + y^2zq = 2z^2$.
   (c) Solve the difference equation $u_{n+1} + \frac{1}{4}u_n = (\frac{1}{4})^4, n \geq 0$,
   u(0)=0 u_1=1 using Z-Transforms [5+5+6]

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Code No: R05010202 **Set No. 2**

I B.Tech Regular Examinations, Apr/May 2007
MATHEMATICAL METHODS
(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering and Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find a real root of the equation x^3-x-11=0 by bisection method

   (b) Construct difference table for the following data: [8+8]

x	0.1	0.3	0.5	0.7	0.9	1.1	1.3
F(x)	0.003	0.067	0.148	0.248	0.370	0.518	0.697

   And find F(0.6) using a cube that fits at x=0.3, 0.5, 0.7 and 0.9 using Newton's forward formula.

2. (a) Derive normal equations to fit the straight line y=a+bx

   (b) Evaluate $\int_0^2 e^{-x^2}$ dx using Simpson's rule.Taking h = 0.25. [8+8]

3. Given y′ = x + sin y, y (0) = 1 compute y(0.2) and y(.4) with h=0.2 using Euler's modified method [16]

4. (a) Find whether the following equations are consistent, if so solve them.
   x+y+2z = 4 ; 2x-y+3z= 9 ; 3x-y-z=2

   (b) Find the rank of the matrix
   $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ by reducing it to the normal form. [8+8]

5. Diagomalize the matrix A = $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ -4 & 4 & 3 \end{bmatrix}$ and hence find A^4. [16]

6. (a) Define the following:
   i. Hermitian matrix
   ii. Skew-Hermitain matrix
   iii. Unitary matrix
   iv. Orthogonal matrix.

   (b) Show that the eigen values of an unitary matrix is of unit modulus. [8+8]

7. (a) Find the Fourier series to represent f(x) = $x^2 - 2$, when $-2 \leq x \leq 2$

   (b) Show that the Fourier sine transform of

   $$f(x) = \begin{cases} x & for\, 0 < x < 1 \\ 2 - x & for\, 1 < x < 2 \\ 0 & for\, x > 2 \end{cases}$$

   is 2 sin $\frac{s(1-\cos s)}{s^2}$. [8+8]

8. (a) Form the partial differential equation by eliminating the arbitrary function from $z = yf(x^2 + z^2)$.

   (b) Solve the partial differential equation $p\sqrt{x} + q\sqrt{y} = \sqrt{z}$

   (c) Find $Z^{-1}\left[\frac{1}{(z-5)^3}\right]$ When |z| > 5. Determine the region of convergence.[5+5+6]

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Code No: R05010202 **Set No. 3**

I B.Tech Regular Examinations, Apr/May 2007
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find a real root of x+$logx_{10}$-2=0 using Newton Raphson method
   (b) If y_x is the value of y at x for which the fifth differences are constant and y_1+y_7=-784, y_2+y_6=686, y_3+y_5=1088, then find y_4. [8+8]

2. (a) Fit a curve of the form y=a+bx+cx^2 for the following data.

x	10	15	20	25	30	35
y	35.3	32.4	29.2	26.1	23.2	20.5

   (b) Evaluate $\int_0^1 \frac{dx}{1+x}$ taking h= .25 using cubic splines. [8+8]

3. Use Runga Kutta fourth order method to evaluate y(.1) and y(.2), given that $\frac{dy}{dx} = x + y, y(0) = 1$ [16]

4. (a) Determine the values of λ for which the following set of equations may posses non-trivial solution and solve them in each case.

$$3x_1 + x_2 - \lambda x_3 = 0;\ \ 4x_1 - 2x_2 - 3x_3 = 0;\ \ 2\lambda x_1 + 4x_2 + \lambda x_3 = 0.$$

   (b) Solve the following tridiagonal system x_1+2x_2=7, x_1-3x_2-x_3=4, 4x_2+3x_3=5 by LU decomposition. [8+8]

5. Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ Satisfies its characteristic equation. Hence Find A^{-1} [16]

6. (a) Show that $A = \begin{pmatrix} a+ic & -b+id \\ b+id & a-ic \end{pmatrix}$ is unitary matrix if $a^2+b^2+c^2+d^2 = 1$.
   (b) Find a matrix P which diagonalize the matrix associated with the quadratic from $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$. [8+8]

7. (a) Obtain the Fourier series for the function $\mathrm{f(x)} = \begin{cases} \pi\mathrm{x}, & 0 \le \mathrm{x} \le 1 \\ \pi(2-\mathrm{x}), & 1 \le \mathrm{x} \le 2 \end{cases}$

(b) Find the Fourier cosine transform of $5^{-2x} + 2e^{-5x}$. [10+6]

8. (a) Form the partial differential equation by eliminating the arbitrary constants log (az-1)=x+ay+b

   (b) Solve the partial differential equation x (y - z) p + y (z - x) q = z (x - y)

   (c) Using convolution theorem find $Z^{-1}\left[\frac{z^2}{(z-4)(z-5)}\right]$ [5+5+6]

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Code No: R05010202 **Set No. 4**

I B.Tech Regular Examinations, Apr/May 2007
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find a real root of xe^x=2 using Regula falsi method

   (b) Find f(22) from the following table using Gauss forward formula

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

[8+8]

2. (a) Fit a straight line fo the form y=a+bx for the following data

x	0	5	10	15	20	25
y	12	15	17	22	24	30

   (b) Evaluate $\int_{6}^{2.0} y\,dx$ using Trapezoidal rule

x	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0
y	1.23	1.58	2.03	4.32	6.25	8.38	10.23	12.45

[8+8]

3. Find the solution of $\frac{dy}{dx} = x - y$ at x=.4 subject to the condition y=1, at x=0 and h=.1 using Milne's method. Use Euler's modified method to evaluate y(.1), y(2) and y(.3). [16]

4. (a) Reduce the matrix A to its normal form.

   Where A = $\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ and hence find the rank

   (b) Show that the only real value of λ for which the following equations have non trivial solution is 6 and solve them, when $\lambda = 6$.
   x +2y + 3z = λx; 3x + y + 2z = λy; 2x + 3y + z = λz. [8+8]

5. Verify that the sum of eigen values is equal to the trace of A for the matrix
   A = $\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ and find the corresponding eigen vectors. [16]

6. (a) Prove that every square matrix can be uniquely expresses as a sum of symmetric and skew symmetric matrices

(b) Find the nature of the quadtratic form index and signature. $10x^2$+$2y^2$+$5z^2$-4xy-10xz+6yz [6+10]

7. (a) Represent the following function by a Fourier sin series. $f(t) = \begin{cases} t, & 0 < t \leq \frac{\pi}{2} \\ \frac{\pi}{2}, & \frac{\pi}{2} < t \leq \pi \end{cases}$

(b) Using Fourier integral theorem prove that e^{-ax}- e^{-bx} $= \frac{2(b^2-a^2}{\pi} \int\limits_0^{\infty} \frac{\lambda \sin \lambda x \, d\lambda}{(\lambda^2+a^2)\ (\lambda^2+b^2)}$ [8+8]

8. (a) Form the partial differential equation by eliminating the arbitrary constants z=ax^3+by^3

(b) Solve the partial differential equation $z(x-y) = px^2 - qy^2$

(c) Solve the difference equation, using Z - transforms $u_{n+2} - 3u_{n+1} + 2u_n = 0$ given that $u_0 = 0 \ \ u_1 = 1$ [5+5+6]

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