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

I B.Tech Supplimentary Examinations, Aug/Sep 2008
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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Find a real root of the equation x–cosx=0 by bisection method.

   (b) Find y(84) using Newton's backward difference formula from the following table

x	60	70	80	90
y	226	250	276	304

[8+8]

2. (a) Fit a straight line y=a+bx from the following data.

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

   (b) A rocket is launched from the ground. Its acceleration measured every 5 seconds is tabulated below. Find the velocity and the position of the rocket at t=40 seconds. Use trapezoidal rule.

t	0	5	10	15	20	25	30	35	40
a(t)	40.0	45.25	48.50	51.25	54.35	59.48	61.5	64.3	68.7

[8+8]

3. Tabulate the values of y(.1) to y(1) taking h=.1 using Euler's method given that $\frac{dy}{dx} = 1 - y$, y(0)=0. [16]

4. (a) Find whether the following system of equations are consistent, if so solve them. 5x+3y+7z=4, 3x+26y+2z=9, 7x+2y+10z=5

   (b) Find the value of K, such that the rank of $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & K & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ is 2 [8+8]

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

6. (a) Define :

      i. Spectral Matrix

      ii. Quadratic Form

iii. Canonical form.

(b) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form. [6+10]

7. (a) Find the half range sine series for $\mathrm{f}\,(\mathrm{x}) = \mathrm{x}\,(\pi - \mathrm{x})\,,\mathrm{in}\quad 0 < \mathrm{x} < \pi$. Deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \ldots\ldots\ldots = \frac{\pi^3}{32}$.

   (b) Using Fourier integral show that $\int\limits_0^\infty \frac{\sin \pi\lambda \sin x\lambda}{(1-\lambda)^2}\, d\lambda = \frac{\pi}{2} \sin x, 0 \le x \le \pi$ [8+8]

   $$= 0, x > \pi$$

8. (a) Form the partial differential equations by eliminating the arbitrary functions $Z = y^2 + 2f(1/x + logy)$

   (b) Solve the partial differential equation $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.

   (c) State and Prove damping rule. [5+6+6]

⋆ ⋆ ⋆ ⋆ ⋆

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

I B.Tech Supplimentary Examinations, Aug/Sep 2008
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

⋆⋆⋆⋆⋆

1. (a) Find a real root of x^4–x–10=0 using bisection method.
   (b) Find f(9) by Newton's Backward formula given that f(2)=94.8, f(5)=87.9, f(8)=81.3, f(11)=75.1. [8+8]

2. (a) Fit a straight line y=a+bx.

x	1	2	3	4	5
y	5	7	9	10	11

   (b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using simpson's $\frac{1}{3}rd$ rule taking h=0.1. [8+8]

3. Find (.2) and y(.4) using Euler's modified formula given that $\frac{dy}{dx} = x - y^2$,y(0)=1. [16]

4. (a) Reduce the matrix
$$A = \begin{bmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 2 \end{bmatrix}$$ to the normal form and hence determine its rank.
   (b) Solve the following tridiagonal system. x_1-3x_2=6, 2x_1+4x_2+x_3=4, x_2+4x_3=7 [8+8]

5. Verify Cayley Hamilton theorem and hence evaluate A^{-1}, if
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$ [16]

6. Show that A= $\begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$ is a skew-Hermitian matrix and also unitary
   Find eigen values and the corresponding eigen vectors of A. [16]

7. (a) Find a Fourier series to represent the function f(x) = e^x, for $-\pi < x < \pi$ and hence derive a series for $\frac{\pi}{\sinh\pi}$

(b) Using Fourier integral show that $e^{-x} \cos x = \frac{2}{\pi} \int\limits_0^{\infty} \frac{\lambda^2+2}{\lambda^2+4} \cos \lambda x d\lambda$ [8+8]

8. (a) Form the partial differential equations by eliminating the arbitrary functions $Z = y^2 + 2f(1/x + logy)$

   (b) Solve the partial differential equation $(x^2 - y^2 - z^2)p + 2xyq = 2xz.$

   (c) State and Prove damping rule. [5+6+6]

⋆⋆⋆⋆⋆

Code No: R05010202

Set No. 3

I B.Tech Supplimentary Examinations, Aug/Sep 2008
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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Find a real root of x–cosx=0 by bisection method.
   (b) Find y(35) using Lagranges intepolation formula

x	25	30	40	50
y	52	67.3	84.1	94.4

[8+8]

2. (a) Fit acurve of the form $y = ae^{bx}$ from the following data.

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

   (b) Evaluate $\int_0^1 e^{-x^2}$ taking h = 0.2 using
      i. Simpson's $\frac{1}{3}rd$
      ii. Trapenzoidal rule. [8+8]

3. Given that $\frac{dy}{dx} = 1+xy$ and y(0)=1, compute y(.1) and y(.2) using Picard's method. [16]

4. (a) Find the rank of the matrix by reducing it to the normal form.

$$\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

   (b) Find whether the following set of equations are consistent if so, solve them.

$$x_1 + x_2 + x_3 + x_4 = 0$$

$$x_1 + x_2 + x_3 - x_4 = 4$$

$$x_1 + x_2 - x_3 + x_4 = -4$$

$$x_1 - x_2 + x_3 + x_4 = 2.$$

[8+8]

5. (a) Find the characteristic roots of the matrix and the corresponding eigen values.
$$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$
   (b) If λ_1, λ_2,........, λ_n are the eigen values of A, then prove that $\lambda_1^k, \lambda_2^k, \lambda_3^k, ...\lambda_n^k$ are eigen values of A^k. [10+6]

6. (a) Prove that the product of two orthogonal matrices is orthogonal.
   (b) Reduce the quadratic form $8x^2$+$7y^2$+$3z^2$–12xy–8yz+4xz to the canonical form [6+10]

7. (a) Expand ($\frac{L}{2}$- x) in $-L < x < L$.
   (b) Expand f(x) = cos x; $0 < x < \pi$ in half range sine series.
   (c) Find the finite Fourier cosine transform of f(x) = $\begin{cases} x & if\ 0 < x < \pi/2 \\ \pi - x & if\ \pi/2 < x < \pi \end{cases}$ [5+5+6]

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]

⋆ ⋆ ⋆ ⋆ ⋆

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

I B.Tech Supplimentary Examinations, Aug/Sep 2008
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

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Find a real root of the equation f(x)=x+logx–2 using Newton Raphson method.
   (b) Find f(22) from the following data using Newton's Backward formula.

x	20	25	30	35	40	45
y	354	332	291	260	231	204

[8+8]

2. Fit a curve of the form $y = A_1e^{\lambda_1 x} + A_2e^{\lambda_2 x}$ for the following data

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
y	1.175	1.336	1.51	1.698	1.904	2.129	2.376	2.646	2.942

[16]

3. Using Euler modified method with h=0.5 first compute y(0.5), y(1), y(1.5) given that $\frac{dy}{dx} = \frac{x+y}{2}; y\,(0) = 2$ then compute y(2) using Milne's predictor corrector method. [16]

4. (a) Determine the rank of the matrix.
   $$A = \begin{bmatrix} 2 & -1 & 3 & 4 \\ 0 & 3 & 4 & 1 \\ 2 & 3 & 7 & 5 \\ 2 & 5 & 11 & 6 \end{bmatrix}$$ by reducing it to the normal form.
   (b) Find whether the following equations are consistent, if so solve them.
   $$x + 2y - z = 3$$
   $$3x - y + 2z = 1$$
   $$2x - 2y + 3z = 2$$
   $$x - y + z = -1.$$

[8+8]

5. Diagnolize the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ [16]

6. (a) Prove that the matrix $\frac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is orthogonal.

   (b) Find the eigen values and the corresponding eigenvectors of the matrix [8+8]
   $\begin{bmatrix} 2-i & 0 & i \\ 0 & 1+i & 0 \\ i & 0 & 2-i \end{bmatrix}$

7. (a) Expand f(x) = cos ax as a Fourier series in $(-\pi, \pi)$ where a is not an integer. Hence prove that $\cot\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2-\pi^2} + \frac{2\theta}{\theta^2-4\pi^2} +$ ....

   (b) If the Fourier transform of f(t), F[f(t)]=f(s) then prove that $F\left[t^n f\left(t\right)\right] = \left(-1\right)^n \frac{d^n}{ds^n}\left(f\left(s\right)\right)$ [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]

⋆ ⋆ ⋆ ⋆ ⋆