Code No: Z0224 / R07

Set No. 1

I B.Tech - Regular Examinations, June 2009
MATHEMATICAL METHODS
(Common to Electrical & Electronic Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Information Technology, Electronics & Control Engineering, Mechatronics, Computer Science & Systems Engineering, Electronics & Telematics, Electronics & Computer Engineering, Production Engineering, Instrumentation & Control Engineering and Automobile Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Show that the system of equations x +2y + z = 3, 2x + 3y +2z = 5, 3x - 5y +5z = 2, 3x + 9y- z = 4 are consistent and solve them
   (b) Write the following equations in matrix form AX = B and solve for X by finding A^{-1}: x + y - 2z = 3, 2x - y + z = 0, 3x +y - z = 8. [8+8]

2. Verify Cayley-Hamiltion Theorem for the matrix $A = \begin{bmatrix} 3 & 4 & 1 \\ 2 & 1 & 6 \\ -1 & 4 & 7 \end{bmatrix}$. Hence find A^{-1}. [16]

3. Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form and specify the matrix of transformation. [16]

4. (a) Find a positive root of x - cos x = 0 by bisection method.
   (b) Using Newton-Raphson method, find a real root of $x^3 - x - 2 = 0$. [8+8]

5. (a) Fit a second degree parabola to the following data:

x:	0	1	2	3	4
f(x):	1	1.8	1.3	2.5	6.3

   (b) The velocity v of a particle moving in a straight line covers a distance x in time t. They are related as follows: Find f' (15).

x:	0	10	20	30	40
v:	45	60	65	54	42

[8+8]

6. Find y(0.1), y(0.2), z(0.1), z(0.2) given $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$ and y(0) = 2, z(0) = 1 by using Taylor's series method. [16]

7. (a) Using Parsevals Identity evaluate $\int_0^\infty \frac{x^2dx}{(a^2+x^2)^2}$, a > 0
   (b) Evaluate $\int_0^\infty \frac{dx}{(a^2+x^2)(b^2+x^2)}$. using transforms. [8+8]

8. (a) Form the partial differential equations by eliminating the arbitrary functions

i. z= f($x^2 + y^2$)
ii. z=yf(x)+xg(y).

(b) Find the Z-transform of the sequences $\{x(n)\}$ where x(n) is

i. n.2^n
ii. an^2+bn+c. [8+8]

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Code No: Z0224 / R07 **Set No. 2**

I B.Tech - Regular Examinations, June 2009
MATHEMATICAL METHODS
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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) Express the following system in matrix form and solve by Gauss elimination method.
$2x_1 + x_2 + 2x_3 + x_4 = 6$; $6x_1 - 6x_2 + 6x_3 + 12x_4 = 36$,
$4x_1 + 3x_2 + 3x_3 - 3x_4 =- 1$; $2x_1 + 2x_2 - x_3 + x_4 = 10$.
(b) Show that the system of equations 3x + 3y + 2z = 1; x + 2y = 4;
10y + 3z = - 2; 2x - 3y - z = 5 is consistent and hence solve it. [8+8]

2. Verify Cayley-Hamiltion Theorem for the matrix $A = \begin{bmatrix} 3 & 4 & 1 \\ 2 & 1 & 6 \\ -1 & 4 & 7 \end{bmatrix}$. Hence find A^{-1}. [16]

3. Verify whether the matrix $\begin{bmatrix} 1/3 & 2/3 & 2/3 \\ 2/3 & 1/3 & -2/3 \\ 2/3 & -2/3 & 1/3 \end{bmatrix}$ is orthogonal: [16]

4. (a) Using Lagrange's formula, fit a polynomial to the data

X:	0	1	3	4
Y:	-12	0	6	12

Also find y at x =2.
(b) If the interval of differencing is unity, prove that $\Delta \tan^{-1}\left(\frac{n-1}{n}\right) = \tan -1\frac{1}{2n^2}$. [8+8]

5. (a) Determine $f'(4)$ from the following data:

x:	1	2	4	8	10
y:	0	1	5	21	27

(b) Fit a curve of the form $y = ab^x$ to the data given below:

x:	1	2	3	4	5	6
y:	151	100	61	50	20	8

[8+8]

6. (a) Obtain y(0.1) given $y' = \frac{y-x}{y+x}$, y(0)=1 by Picard's method.

(b) Using Taylors series method solve $y' = $ xy+y^2, y(0) = 1 at x= 0.1, 0.2, 0.3. [8+8]

7. (a) Find the Fourier series for f(x) = $2l$x- x^2 in $0 < x < 2l$ and hence deduce 1- $\frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ... = \frac{\pi^2}{12}$.

   (b) Find the Fourier sine series for f(x) = 2x- x^2, in 0 < x < 3 and f(x+3)=f(x). [8+8]

8. (a) Form the partial differential equations by eliminating the arbitrary constants
      i. $x^2 + y^2 + (z - c)^2 = a^2$
      ii. z=(x^2+a)(y^2+b)

   (b) Find the Z-transform of the sequences $\{x(n)\}$ where x(n) is
      i. $\left(\frac{1}{3}\right)^n$
      ii. $(3)^n\ cos\frac{n\pi}{2}$. [8+8]

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Set No. 3

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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) Show that the system x + 2y - 5z = - 9, 3x - y + 2z = 5, 2x + 3y - z = 3, 4x - 5y + z = - 3 is consistent and solve it.
   (b) Solve the equations by finding the inverse of the coefficient matrix: x+y+z = 1, 3x+5y+6z = 4, 9x+26y+36z = 16. [8+8]

2. (a) Given $A = \begin{bmatrix} 1 & -2 & -3 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, find its inverse
   (b) Find tan A if $A = \begin{bmatrix} 1 & 20 & 0 \\ -1 & 7 & 1 \\ 3 & 0 & -2 \end{bmatrix}$ [8+8]

3. Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form and specify the matrix of transformation. [16]

4. (a) Given $u_1 = 22$, $u_2 = 30$, $u_4 = 82$, $u_7 = 106$, $u_8 = 206$, find u_6. Use Lagrange's interpolation formula.
   (b) Find a real root of $x^3-x-2=0$. [8+8]

5. (a) Find the first and second derivative of the function tabulated below at x = 0.6.

x:	0.4	0.5	0.6	0.7	0.8
y:	1.5836	1.7974	2.0442	2.3275	2.6511

   (b) Fit a straight line to the data given below:

x:	1	3	5	7	9
y:	1.5	2.8	4.0	4.7	6.0

[8+8]

6. (a) Using R - K method of fourth order solve $y' = \frac{y^2-x^2}{y^2+x^2}$ y(0) = 1. Find y(0.2) and y(0.4).
   (b) Solve numerically $y' = y + e^x$, y(0) = 0 for x= 0.2, 0.4 by Euler's method. [8+8]

7. Find the Fourier Transforms of $f(x) = \begin{cases} a^2 - x^2; & |x| < 1 \\ 0; & |x| > 1 \end{cases}$

   Deduce that
   $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt = \frac{\pi}{4.}$ Using Parseval's identity prove that $\int_0^\infty (\frac{\sin t - t\cos t}{t^3})^2 dt = \frac{\pi}{15}$. [16]

8. (a) Form the partial differential equations by eliminating the arbitrary constants
      i. $x^2 + y^2 + (z - c)^2 = a^2$
      ii. z=$(x^2$+a)$(y^2$+b)

   (b) Find the Z-transform of the sequences $\{x(n)\}$ where x(n) is
      i. $\left(\frac{1}{3}\right)^n$
      ii. $(3)^n \; cos\frac{n\pi}{2}$. [8+8]

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Code No: Z0224 / R07 **Set No. 4**

I B.Tech - Regular Examinations, June 2009
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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) Express the following system in matrix form and solve by Gauss elimination method.
$2x_1 + x_2 + 2x_3 + x_4 = 6$; $6x_1 - 6x_2 + 6x_3 + 12x_4 = 36$,
$4x_1 + 3x_2 + 3x_3 - 3x_4 = -1$; $2x_1 + 2x_2 - x_3 + x_4 = 10$.
(b) Show that the system of equations 3x + 3y + 2z = 1; x + 2y = 4; 10y + 3z = - 2; 2x - 3y - z = 5 is consistent and hence solve it. [8+8]

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

3. Find the rank and index of the quadratic forms and reduce it to canonical form
$3x^2+5y^2+6z^2-2xy + 2xz - 2yz$

4. (a) Given $u_1 = 22$, $u_2 = 30$, $u_4 = 82$, $u_7 = 106$, $u_8 = 206$, find u_6. Use Lagrange's interpolation formula.
(b) Find a real root of x^3-x-2=0. [8+8]

5. (a) Evaluate $\int_0^{\frac{\pi}{2}} e^{\sin x}dx$ taking h= $\frac{\pi}{6}$
(b) Given the following data, find $f'(6)$

x:	0	2	3	4	7	9
y:	4	26	58	112	466	922

[8+8]

6. Find y(0.1), y(0.2), z(0.1), z(0.2) given $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$ and y(0) = 2, z(0) = 1 by using Taylor's series method. [16]

7. (a) Expand $f(x) = \begin{cases} 1; & 0 < x < \pi \\ 0; & \pi < x < 2\pi \end{cases}$
as a Fourier series.

(b) Obtain the Fourier series expansion of f(x) given that

$f(x) = \begin{cases} 1; & 0 < x < 1 \\ 2; & 1 < x < 3 \end{cases}$ and f(x)=3/2 when x=0, 1, 3 and f(x+3)=f(x) for all x. [8+8]

8. (a) Solve $(2z - y)p + (x + z)q = -(2x + y)$

(b) Solve the difference equation, using Z-transform
x(k+2)-5x(k+1)+6x(k)=4^n, given x(0)=0, x(1)=1. [8+8]

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