Code No: R10107/R10 **Set No. 1**

I B.Tech I Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
(Common to Civil Engineering, Electrical & Electronics Engineering, Computer Science & Engineering, Electronics & Instrumentation Engineering, Aeronautical Engineering, Bio-Technology and Automobile Engineering)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find value of K if rank of A is 3, if $A = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 1 & 2 & 0 & K \end{bmatrix}$
   (b) Solve by Gauss elimination method 10x+y+z=12; 2x+10y+z=13; x+y+5z=7; [7+8]

2. (a) Prove that the Eigen values of a triangular matrix are diagonal elements of the matrix
   (b) Find eigen vectors of B=2A^2– A + 3I when $A = \begin{bmatrix} 8 & -4 \\ 2 & 2 \end{bmatrix}$ [5+10]

3. Define the nature of the quadratic form. Identify the nature of the quadratic form $x_1^2 + 4x_2^2 + x_3^2 - 4x_1x_2 + 2x_1x_3 - 4x_2x_3$ [15]

4. (a) Evaluate the real root of the equation $x^2 - 9x + 1 = 0$ by Bisection method
   (b) Compute the real root of the equation $x^3 - x^2 - 1 = 0$by the method of false position. [8+7]

5. (a) Compute the approximate value of e^{-x} when x= 1.7489 from the following table using the Gauss forward interpolation formula.

x	1.72	1.73	1.74	1.75	1.76	1.77	1.78
e^{-x}	0.179066	0.177284	0.175520	0.173774	0.172045	0.170333	0.168638

   (b) Find the Parabola passing through the points (0, 1), (1,3) and (3,5), Using Lagrange's Interpolation formula. [8+7]

6. (a) Find the first and second derivatives of the function tabulated below at the point x = 1.5.

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.0	13.625	24.0	38.875	59.0

   (b) Evaluate $\int_{0.6}^{2.0} y\,dx$ using Trapizoidal, Simpsons 1/3 and Simpsons 3/8 rules.

X	0.6	0.8	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+7]

7. (a) Solve $y^1=3x+y/2$, $y(0)=1$ by Taylor series method and hence find $y(0.1)$, $y(0.2)$

   (b) Solve the equation $\frac{dy}{dx} = xy + 1$, $y(0)=1$ by Picard's method and hence find $y(0.1)$ [8+7]

8. (a) Fit a least square parabola $y= a+bx+cx^2$ to the following data

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

   (b) Fit a straight line of the form $y= a+bx$ to the following data

x	1	2	4	5	6	8	9
y	2	5	7	10	12	15	19

[7+8]

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Code No: R10107/R10 **Set No. 2**

I B.Tech I Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find rank of $A = \begin{bmatrix} 2 & 1 & 3 & 1 \\ 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \end{bmatrix}$ using Normal Form
   (b) Solve by Gauss seidal method x+4y+15z=24, x+12y+z=26, 10x+y-2z=10 [7+8]

2. (a) Find Eigen Vectors of $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$
   (b) If λ is an Eigen value of A then prove that $\frac{|A|}{\lambda}$is an Eigen value of Adj. A [7+8]

3. Find the rank, signature and index of the quadratic form $2x_1^2 + x_2^2 - 3x_3^2 + 12x_1x_2 - 4x_1x_3 - 8x_2x_3$by reducing it to normal form .Also write the linear transformation which brings about the normal reduction [15]

4. (a) Using Newton- Raphson's method compute $\sqrt{41}$ correct to four decimal places.
   (b) Find a real root of the equation $e^x = x+2$in the interval [1, 1.4] using bisection method. [8+7]

5. (a) Apply Gauss backward interpolation formula to find y when x = 26 form the following table:

x	20	24	28	32
Y	2854	3162	3544	3992

   (b) Using Lagrange's interpolation formula, find the value of y when x = 2 from the following data:

x	1	3	4	6
y	4	40	85	259

[8+7]

6. (a) Find the value of $f'(x)$ at x=0.01 from the following table using Bessel's formula.

x	0.01	0.02	0.03	0.04	0.05	0.06
f(x)	0.1023	0.1047	0.1071	0.1096	0.1122	0.1148

   (b) Find the area bounded by the curve y = $e^{-\frac{x^2}{2}}$, x - axis between x = 0 and x = 3 by using Simpson's 3/8 rule. [8+7]

7. (a) Solve y^1=x-y, y(0)=1 by modified Euler's method and find y(0.1), y(0.2)
   (b) Apply third order R-K method to find y(0.25) where y^1=1+xy, y(0)=1 [8+7]

8. (a) Fit a power curve $y=ax^b$ to the following data

x	5	6	7	8	9	10
y	133	55	23	7	2	2

   (b) Fit a curve of the type $y= a+bx+cx^2$ to the following data

x	0	1	2	3	4	5	6
y	14	18	23	29	36	40	46

[7+8]

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Code No: R10107/R10 **Set No. 3**

I B.Tech I Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find rank using Normal Form $A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$

   (b) Solve Homogeneous equations $x_1+2x_2+3x_3=0$, $2x_1+3x_2+x_3=0$, $4x_1+5x_2+4x_3=0$, $X_1+x_2-2x_3=0$ [7+8]

2. (a)Find Eigen values and Eigen vectors of $\begin{bmatrix} 8 & 4 \\ 2 & 2 \end{bmatrix}$

   (b) If λ is an Eigen value of A then prove that λ^{-1} is an Eigen value of A^{-1} if it exists [7+8]

3. Find the rank, signature and index of the quadratic form $2x_1^2 + x_2^2 - 3x_3^2 + 12x_1x_2 - 4x_1x_3 - 8x_2x_3$by reducing it to normal form .Also write the linear transformation which brings about the normal reduction [15]

4. (a) Find out square root of 25 given x_0=2, x_1=7 using Bisection method

   (b) Solve the equation $x^3 + 2x^2 + 10x = 20$by iteration method [8+7]

5. (a) Use gauss forward interpolation formula to estimate f(32), given f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386, f(40) = 0.3794.

   (b) Find the interpolating polynomial f(x) from the table given below.

x	0	1	4	5
f(x)	4	3	24	39

   [8+7]

6. (a) Using the table below, find $f'(0)$

x	0	2	3	4	7	9
f(x)	4	26	58	110	460	920

   (b) Evaluate $\int_0^1 \sqrt{1+x^3}$ dx taking h = 0.1 using Simpson's $3/8^{th}$ rule. [8+7]

7. (a) Solve y^1=x+y subject to the condition y(0)=1 by Taylor series method and hence find y(0.2), y(0.4)

   (b) Solve y^1=x-y, y(0)=1 by Picard's method and hence find y at x=0.2 [8+7]

8. (a) Fit a curve of the type y= a+bx+cx^2 to the following data

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

(b) Fit a curve of the type y=ab^x to the following data by the method of least squares

x	1	2	5	10	20	30	40	50
Y	98.2	91.7	81.3	64	36.4	32.6	7.1	11.3

[7+8]

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Code No: R10107/R10 **Set No. 4**

I B.Tech I Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
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Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find rank of matrix using Normal form $A = \begin{bmatrix} 1 & 2 & 3 & -2 \\ 2 & -2 & 1 & 3 \\ 3 & 0 & 4 & 1 \end{bmatrix}$

   (b) Solve system of equations, if consistent 2x-y-z=2 , x+2y+z=2, 4x-7y-5z=2 [7+8]

2. Verify Cayley - Hamilton theorem and find A^{-1} if $A = \begin{bmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ [15]

3. Reduce the quadratic form to canonical from by an orthogonal reduction and state the nature of the quadratic form $5x^2 + 26y^2 + 6xy + 4yz + 14zx$. Also find its rank signature and index. [15]

4. (a) Using Newton-Raphson's method find the square root of a number and hence find the square root of 24.

   (b) Find a real root of the equation $x=e^{-x}$, using Bisection method [8+7]

5. (a) Apply Gauss's forward formula to find f(x) at x = 3.5 from the table below.

X	2	3	4	5
F(x)	2.626	3.454	4.784	6.986

   (b) Find sin 45^0 using Gauss's backward interpolation formula given that sin 20^0 = 0.342, sin 30^0 = 0.502, sin 40^0 =0.642, sin 50^0 = 0.766, sin 60^0 =0.866, sin 70^0 = 0.939, sin 80^0 = 0.984. [8+7]

6. (a) Given the following table. Find $f'(1)$ and $f''(3)$

x	0	2	4	6	8
f(x)	7	13	43	145	367

   (b) Find approximate value of $\int_1^{1.04} f(x)dx$using the following table.

x	1	1.01	1.02	1.03	1.04
f(x)	3.953	4.066	4.182	4.300	4.421

   [8+7]

7. (a) Given that $\frac{dy}{dx} = \frac{(1+x^2)y^2}{2}$, y(0)=1, y(0.1)=1.06, y(0.2)=1.12, y(0.3)=1.21 then evaluate y(0.4) by Milne's predictor corrector method

(b) Solve $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0)= 1 estimate y(0.1) and y(0.2) using Euler's method in 5 steps [8+7]

8. (a) Fit a least square parabola y= a+bx+cx^2 to the following data

x	1	2	3	4	5
y	5	12	25	44	69

(b) Fit a straight line of the form y= a+bx to the following data

x	1	2	3	4	5
y	5	12	26	60	90

[8+7]

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