Correction in I B.Tech I Semester Regular Examinations **MATHEMATICAL METHODS(R10107)**

Set No 3. -- Question No: 3

Reduce the quadratic form $3x^2 - 2y^2 - z^2 - 4xy + 12yz + 8zx$ to canonical form by orthogonal transformation .Also find its nature, rank index signature and the transformation which transforms quadratic form to canonical from.

Code No: R10107/R10

$$\boxed{\textbf{Set No. 1}}$$

I B.Tech I Semester Regular Examinations, February 2013
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
$\star\star\star\star\star$

1. (a) Find rank using Echelon form $A = \begin{bmatrix} 10 & -2 & 3 & 0 \\ 1 & 5 & 1 & 2 \\ -1 & -2 & 10 & 1 \\ 2 & 3 & 4 & 9 \end{bmatrix}$

    (b) Solve by Gauss seidal method $5x_1+x_2+2x_3+x_4=10$, $-6x_2+x_3+x_4=-10$, $4x_1+8x_3-3x_4 =9$, $2x_1+2x_2-x_3+7x_4=12$ [7+8]

2. Find Eigen Values and Eigen vector of $A = \begin{bmatrix} 2 & 2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [15]

3. Find the nature of the quadratic form $2x^2 + 4xy + y^2 + 3yz + 4z^2$ [15]

4. (a) Evaluate the real root of the equation $x^4 - x - 10 = 0$ by Bisection method

    (b) Compute the real root of the equation $xe^x = 2$ by the method of false position.
                                                                                    [8+7]

5. (a) Find the value of y from the following data at x = 0.47

X:	0	1	2	3	4	5
Y:	1	2	4	7	11	16

    (b) Use Lagrange's interpolation formula, find f(5) from the following data.

x	1	3	4	6	9
Y = f(x)	-3	9	30	132	156

[8+7]

6. (a) A rod is rotating in a plane. The following Table gives the angle θ(in radians) through which the rod has turned for various values of time t (in seconds).

t :	0	0.2	0.4	0.6	0.8	1.0	1.2
θ :	0	0.12	0.49	1.12	2.02	3.20	4.67

    Find the angular velocity and angular acceleration of the rod at t = 0.6.

    (b) Using the Simpson's Rule, evaluate $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range (of integration) into 6 equal parts.   [8+7]

7. (a) Solve $y^1=x+y$, $y(1)=1$ by Picard's method hence find y(o.1), y(o.2) and check your answer with exact solution

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Set No. 1

(b) Solve $\frac{dy}{dx} = \frac{2-y^2}{5x}$ Find y(4.4) by modified Euler's method if y=1 when x=4,h=0.20

[8+7]

8. (a) Fit a curve of the type y=ae^{bx} to the data by the method of least squares

x	77	100	185	239	285
y	2.4	3.4	7	11.1	19.6

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

x	0	1	2	3	4	5	6	7
y	10	21	35	59	92	200	400	610

[7+8]

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Set No. 2

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Answer any FIVE Questions
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1. (a) Find rank using Echelon form $A = \begin{bmatrix} 10 & -2 & 3 & 0 \\ 1 & 5 & 1 & 2 \\ -1 & -2 & 10 & 1 \\ 2 & 3 & 4 & 9 \end{bmatrix}$

   (b) Solve by Gauss seidal method $5x_1+x_2+2x_3+x_4=10$, $-6x_2+x_3+x_4=-10$,
   $4x_1+8x_3-3x_4 =9$, $2x_1+2x_2-x_3+7x_4=12$ [7+8]

2. Verify Cayley – Hamilton theorem and find A $^{-1}$ and A^4 if $A = 2 \begin{bmatrix} 1 & 2 & 4 \\ -2 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

   [15]

3. (a) Find the nature of the quadratic form $5x^2 + 5y^2 + 14z^2 + 2xy - 16yz - 8zx$

   (b) If A$= \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$ then find A^{50} [8+7]

4. (a)Compute the real root of the equation $x^3 - x - 11 = 0$ by Bisection method
   (b)Evaluate the real root of the equation $x^2 - \log_e x - 12 = 0$ by the method of
   false position.   [8+7]

5. (a) The following table gives the viscosity of anoil as a function of temperature.
   Use Lagrange's formula, to find viscosity of oil at a temperature of 140 ^{o}.

Temp.^{o} :	110	130	160	190
Viscosity :	10.8	8.1	5.5	4.8

   (b) Find the cubic polynomial which takes the following values, hence or otherwise
   evaluate f(4).

x	0	1	2	3
F(x)	1	2	1	10

   [8+7]

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

x	0	2	3	4	7	9
f(x)	4 s	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) Given $\frac{dy}{dx} = \frac{x^2}{x^2+1}$ with y(o)=0 use Picard's method second approximation to
   Obtain y and find y(1)

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$$\boxed{\textbf{Set No. 2}}$$

(b) Solve $y^1 = xy + y^2$, $y(o) = 1$ by R-K method fourth order and hence find $y(o.1)$, $y(o.2)$ [8+7]

8. (a) Fit a curve of the type $y = ae^{bx}$ to the data by the method of least squares

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

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

x	0.0	0.2	0.4	0.7	0.9	1
y	1.016	0.768	0.648	0.401	0.272	0.193

[7+8]

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$$\boxed{\textbf{Set No. 3}}$$

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

Answer any FIVE Questions
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$\star\star\star\star\star$

1. (a) Find rank of A using Echelon form $A = \begin{bmatrix} 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \\ 5 & 6 & 7 & 8 & 9 \\ 10 & 11 & 12 & 13 & 14 \\ 15 & 16 & 17 & 18 & 19 \end{bmatrix}$

   (b) Find rank of A using Normal form $A = \begin{bmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ 1 & 2 & 7 & 6 \end{bmatrix}$　　[7+8]

2. Verify Cayley – Hamilton theorem, find A^{-1} and A^3 if $A = \begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 5 \end{bmatrix}$
   [15]

3. Reduce the quadratic form $3x^2 - 2y^2 - z^2 - 4xy + 12yz - +8zx$ to canonical form by orthogonal transformation .Also find its nature, rank index signature and the transformation which transforms quadratic form to canonical from.　　[15]

4. (a) Find a real root the equation $1 + \tan^{-1}(x) - x = 0$ near x=1correct up to 4 decimal places using iteration method

   (b) By using bisection method find an approximate root of the equation $\sin x = \frac{1}{x}$ that lies between x=1 and x=1.5 (measured in radians).Carryout computation upto 7th stage.　　[8+7]

5. (a) The values of annuities for certain ages are given for the following ages. Find the annuity at age $27\frac{1}{2}$ using Gauss's forward interpolation formula

Age:	25	26	27	28	29
Annuity:	16.195	15.919	15.630	15.326	15.006

   (b) Find f(2.5) using Newton's forward formula from the following table

X	0	1	2	3	4	5	6
Y	0	1	16	81	256	625	1296

   [8+7]

6. (a) The velocity v of a particle moving in a straight line covers at distance x in time t. They are related as given in the following table. Find $f'(15)$

X	0	10	20	30	40
Y	45	60	65	54	42

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(b) Evaluate $\int_0^1 x^3$ dx with five sub-intervals by Trapezoidal rule. [8+7]

7. Solve by Milne's predictor corrector method to find y(0.8) from $\frac{dy}{dx} = 1 + y^2$, y(0)=0 by obtaining the initial values y(o.2), y(o.4), y(o.6) from R-K method. [15]

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

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

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

x	0	5	10	15	20
y	7	-11	16	20	26

[8+7]

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Set No. 4

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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 $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ using Echelon form   [7+8]

    (b) Solve by Gauss Elimination method 2x+y+z=10 , 3x+2y+3z=18 , x+4y+9z=16

2. Verify Cayley – Hamilton theorem and find A $^{-1}$ if $A = \frac{1}{4} \begin{bmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

[15]

3. Reduce the quadratic form X^TAX to canonical form for the matrix **A=**
$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

by finding its Eigen values and Eigen vectors. Also find the corresponding linear
transformation and its nature rank and signature.   [15]

4. (a) Using Newton-Raphson's Method, find a positive root of Cos x-x e^x=0

    (b) Find a real root of f(x) =x+tanx-1=0 in the interval (0, 0.5) by using bisection
    method.   [8+7]

5. (a) Applying Gauss backward interpolation formula find y when x = 25 for the
    following data

X:	20	24	28	32
Y:	2854	3162	3544	3991

    (b) Using Largrange's formula calculate f(3) from the following table.

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

    [8+7]

6. (a) From the following table find y' at x=30

x	30	35	40	45	50
y	15.9	14.9	14.1	13.3	12.5

    (b) Evaluate $\int_0^{\pi/2} e^{sin\ x}$ dx taking h = $\pi/6$ [8+7]

7. (a) Solve y^1=xy$^{1/3}$,y(1)=1 by Taylor series method and find y(1.1), y(1.2)

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    (b) Find an approximate value of y for x=0.1, 0.2 if y^1=x+y and y(1)=1 by Picard's method and compare the solution with exact solution.   [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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