Code No: R10206/R10 **Set No. 1**

I B.Tech II Semester Supplementary Examinations, Feb. 2015
MATHEMATICAL METHODS
(Common to Mechanical Engineering, Electronics & Communication Engineering, Chemical Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Mining and Petroliem Technology)

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 $A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$

   (b) Are the following equations consistent, if so solve them 2x+3y-z-2w=2, 4x+5y+3z=7 x+y+2z+w=5 [7+8]

2. Find Eigen Vectors of $A = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 4 & 3 \\ 0 & 2 & 0 \end{bmatrix}$ [15]

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) Compute the real root of the equation $3x = \cos x + 1$ by Bisection method

   (b) Compute the real root of the equation $\tan x = x$ by iteration method. [8+7]

5. (a) If the interval of differencing is unity, prove the following:
   (i)$\Delta\left(\frac{2^x}{x!}\right) = \frac{2^x(1-x)}{(x+1)!}$

   (ii) $\Delta\left\{tan^{-1}\left(\ \frac{n-1}{n}\ \right)\right\} = \ tan^{-1}\left(\ \frac{1}{2n^2}\right)$

   (b) Using the Newton's forward differences formula, find the interpolating polynomial for the function y = f(x) given by f(0) = 1, f(1) = 2, f(2) = 1, f(3) = 10. Hence evaluate f(0.75) and f(-0.5). [8+7]

6. (a) Find $\frac{dy}{dx}$at x = 7.47 from the following table.

X	7.47	7.48	7.49	7.5	7.51	7.52	7.53
Y	0.193	0.195	0.198	0.201	0.203	0.206	0.208

   (b) The following Table gives the temperature θ (in degrees of Celsius) of a cooling body at different instants of time t (in seconds):

t :	1	3	5	7	9
θ :	85.3	74.5	67.0	60.5	54.3

   Find approximately the rate of cooling at t = 8 seconds. [8+7]

7. (a) Solve $\frac{dy}{dx} = \frac{1}{y+x}$ y(0)= 1 by R-K method and hence find y(0.1)

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(b) Solve $y^1=1+xy$ subject to the condition $y(0)=2$ by modified Euler's method and hence find $y(0.1)$, $y(0.2)$ [8+7]

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

x	1	2	3	4	5
y	2.6	3.3	4.2	5.4	6.9

(b) .Fit straight line to the data by the method of least squares

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

[8+7]

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Code No: R10206/R10 **Set No. 2**

I B.Tech II Semester Supplementary Examinations, Feb. 2015
MATHEMATICAL METHODS
(Common to Mechanical Engineering, Electronics & Communication Engineering, Chemical Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Mining and Petroliem Technology)

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 Matrix using Echelon form where $A = \begin{bmatrix} 1 & -1 & 2 & 0 \\ 0 & 1 & 2 & 1 \\ 5 & 3 & 14 & 4 \end{bmatrix}$
   (b) Show that equations x+y+z=6 , x+2y+3z=14 , x+4y+7z=30 are consistent and solve them [7+8]

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

3. Determine the nature, index rank, and signature of the quadratic form $5x_1^2 + 26x_2^2 + 10x_3^2 + 6x_1x_2 + 14x_1x_3 + 4x_2x_3$ [15]

4. (a) Find the root of the equation $x^3 - 6x + 4 = 0$ by Newton-Raphson's Method correct to five decimal places
   (b) Find a root of the equation $x \log_{10} x = 1.2$ by Bisection method. [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

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

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

x	0	1	2	3	4	5	6
y	3	3	5	9	15	23	33

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

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5	6

[8+7]

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Code No: R10206/R10 **Set No. 3**

I B.Tech II Semester Supplementary Examinations, Feb. 2015
MATHEMATICAL METHODS
(Common to Mechanical Engineering, Electronics & Communication Engineering, Chemical Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Mining and Petroliem Technology)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Using Echelon form, find rank of $A = \begin{bmatrix} 1 & 2 & 1 & 0 \\ -2 & 4 & 3 & 0 \\ 1 & 0 & 2 & 8 \end{bmatrix}$
   (b) Solve system of equations x+y+z=3 , 2x+3y+2z=7 , 4x+2y+3z=9, using Gauss elimination method. [7+8]

2. (a) Find Eigen Values and Eigen Vectors of $\begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$
   (b) Prove that the Eigen values of a square matrix A and its transpose are same [10+5]

3. Reduce the quadratic form $7x^2 + 6y^2 + 5z^2 - 4xy - 4yz$ to canonical from by diagonlzation. Also find the nature, index and signature and the linear transformation. [15]

4. (a) Using Newton-Raphson's method find a root of $2x - 3\sin x = 5$which is nearer to 3
   (b) Find the root between 2 and 3 of the equation $x^4 - x^3 - 2x^2 - 6x - 4 = 0$ using bisection method. [8+7]

5. (a) Interpolate by means of Gauss's backward formula the sales of a concern for the year 1976 for the given data

Year:	1940	1950	1960	1970	1980	1990
Sales (in lakhs of Rs.)	17	20	27	32	36	38

   (b) Calculate f (1.30) from the following table.

X:	0.0	1.2	2.4	3.7
F(x):	3.41	2.68	1.37	-1.18

   [8+7]

6. (a) The population of a certain town (as obtained from census data) is shown in the following table:

Year	1951	1961	1971	1981	1991
Population(in thousand)	19.96	39.65	58.81	77.21	94.61

   Estimate the rate of growth of the population in the year 1981

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(b) The following table gives the value of f(x) at equal intervals of x.

x	0	0.5	1.0	1.5	2.0
y	0.399	0.352	0.242	0.129	0.054

Evaluate $\int_0^2 f(x)\,dx$ using Simpsons 1/3 and Simpsons 3/8 rule. [8+7]

7. (a) Solve $\frac{dy}{dx} = \frac{1}{y+x}$ y(0)= 1 by R-K method and hence find y(0.1)

(b) Solve y^1=1+xy subject to the condition y(0)=2 by modified Euler's method and hence find y(0.1), y(0.2) [8+7]

8. (a) Fit a least square straight line to the following data

x	1	2	3	4	5
y	16	19	23	26	30

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

x	0	1	2	3	4
y	2.1	3.5	5.4	7.3	8.2

[8+7]

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Code No: R10206/R10 **Set No. 4**

I B.Tech II Semester Supplementary Examinations, Feb. 2015
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 $A = \begin{bmatrix} -1 & 2 & 1 & 8 \\ 2 & 1 & -1 & 0 \\ 3 & 2 & 1 & 7 \end{bmatrix}$ by using Echelon form

   (b) Find rank of $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$ using Normal Form [7+8]

2. Verify Cayley – Hamilton theorem and find A^{-1}if $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$ [15]

3. (a) Define quadratic form, rank, signature and index of the quadratic form.

   (b) Explain about the Nature of the quadratic form and find the nature of Quadratic form $2x_1x_2 - 4x_1x_3 - 4x_2x_3$ [5+10]

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 7^{th} stage. [8+7]

5. (a) (i) Solve $\Delta\left(e^{ax}\log bx\right)$ (ii) Prove that $\nabla^6 y_8 = \Delta^6 y_2$.

   (b) From the following table for find f(3.3) using gauss forward interpolation formula.

x	1	2	3	4	5
Y = f(x)	15.30	15.10	15.00	14.50	14.00

   [8+7]

6. (a) The population of a certain town (as obtained from census data) is shown in the following table:

Year	1891	1901	1911	1921	1931
Population(in thousand)	46	66	81	93	101

   Estimate the rate of growth of the population in the year 1921

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(b) When a train is moving at 30 m/sec, steam is shut off and brakes are applied. The speed of the train per second after t seconds is given by

Time (t):	0	5	10	15	20	25	30	35	40
Speed(v):	30	24	19.5	16	13.6	11.7	10	8.5	7.0

Using Simpson's rule, determine the distance moved by the train in 40 seconds.

[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 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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