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

**I B.Tech I Semester Supplementary Examinations, Sept - 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 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. Verify Cayley – Hamilton theorem and find $A^{-1}$ if $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ [15]

3. Reduce the quadratic form $3x^2 + 3y^2 + 3z^2 + 4xy + 8yz + 8xz$ to canonical form by Diagonalization. Also find its nature, index rank and signature? [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) 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
   (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 $y^1$=$x^2$y-1, y(0)=1 by Taylor series method and hence find y at x=0.1

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(b) Solve $y^1=y$, $y(0)=1$ by Picard's method and compare the solution with exact solution. [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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Code No: R10107/R10 **Set No. 2**

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**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 $A = \begin{bmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$

   (b) Solve by Gauss elimination method $2x_1+x_2+2x_3+x_4=6$, $x_1-x_2+x_3+2x_4=6$, $4x_1+3x_2+3x_3-3x_4=1$, $2x_1+2x_2-x_3+x_4=10$ [7+8]

2. (a) Find Eigen Vectors of $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

   (b) The Eigen vectors corresponding to two different eigen values are linearly independent [10+5]

3. Using Lagrange's reduction Reduce the quadratic form $x_1^2 + 4x_2^2 + x_3^2 - 4x_1x_2 + 2x_1x_3 - 4x_2x_3$ to canonical form .Also find its nature, rank signature and the linear transformation. [15]

4. (a) Find a real root of the equation $x^3 - x - 4 = 0$, using Regula - Falsi method.

   (b) Find a real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson's method. [8+7]

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

   (b) Given that $\sin 45^o = 0.7071$, $\sin 50^o = 0.8192$, $\sin 60^o = 0.8660$, find $\sin 48^o$. [8+7]

6. (a) Given the following data of X and Y

| X | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 |
|---|---|---|---|---|---|---|
| Y | 2.72 | 3.32 | 4.06 | 4.96 | 6.05 | 7.39 |

   Find the first and second derivatives at x = 1.0

   (b) The table below shows the temperature f(t) as a function of time

| t | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| f(t) | 81 | 75 | 80 | 83 | 78 | 70 | 60 |

   Use Simpson's 1/3 method to estimate $\int_1^7 f(t)\,dt$. [8+7]

7. (a) Solve $y^1=x^2y-1$, $y(0)=1$ by Taylor series method and hence find y at x=0.1

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(b) Solve $y^1=y$, $y(0)=1$ by Picard's method and compare the solution with exact solution. [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. 3**

**I B.Tech I Semester Supplementary Examinations, Sept - 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 Echelon form $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$
   (b) Solve the equations using Gauss Jordan method
   $x_1+x_2+x_3=8$ , $2x_1+3x_2+2x_3=19$ , $4x_1+2x_2+3x_3=23$ [7+8]

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

3. (a) Find the nature of the quadratic form $2x_1^2 + 3x_2^2 + 4x_3^2 + 2x_1x_2$
   (b) Reduce the following quadratic form to canonical form by Lagrange's reduction
   $2x_1^2 + 7x_2^2 + 5x_3^2 - 8x_1x_2 - 10x_2x_3 + 4x_1x_3$ [7+8]

4. (a) Find a root of the equation $x^3 - 4x - 9 = 0$ by Bisection method.
   (b) Find the value of $\sqrt{35}$ by Newton-Raphson Method. [8+7]

5. (a) Find y(1.6) using Newton's forward difference formula from the table

| x | 1 | 1.4 | 1.8 | 2.2 |
|---|---|---|---|---|
| y | 3.49 | 4.82 | 5.96 | 6.5 |

   (b) Using Gauss's forward interpolation formula find y at x = 1.7489 given that

| x : | 1.72 | 1.73 | 1.74 | 1.75 | 1.76 | 1.77 | 1.78 |
|---|---|---|---|---|---|---|---|
| y: | 0.1791 | 0.1773 | 0.1775 | 0.1738 | 0.1720 | 0.1703 | 0.1686 |

   [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(1)=1 by Picard's method hence find y(0.1), y(0.2) and check your answer with exact solution

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(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 $y=ab^x$ to the following data by the method of least squares

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

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

| x | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| y | 2.98 | 4.26 | 5.21 | 6.1 | 6.8 | 7.5 |

[8+7]

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

**I B.Tech I Semester Supplementary Examinations, Sept - 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 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. (a) Find Eigen Vectors of $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$
   (b) The Eigen vectors corresponding to two different eigen values are linearly independent [10+5]

3. Determine diagonal matrix orthogonally similar to the real symmetric Matrix $\mathbf{A}=\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ .Also find the matrix of transformation. [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) 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(4) from the following data.

| x | 1 | 2 | 5 | 6 | 9 |
|---|---|---|---|---|---|
| y = f(x) | 2 | 8 | 17 | 20 | 35 |

   [8+7]

6. (a) A rod is rotating in a plane. The following Table gives the angle $\theta$( 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 |
|---|---|---|---|---|---|---|---|
| $\theta$ : | 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]

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

7. (a) Solve $y^1=x^2+y^2$ subject to the condition y(0)=0 for x=0.4 by Taylor series method

   (b) Solve $y^1=1+xy$, y(0)=1 by Picard's method and hence find y(0.1), y(0.2) [8+7]

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

| x | 1 | 2 | 3 | 4 | 5 | 15 |
|---|---|---|---|---|---|---|
| y | 2 | 3 | 5 | 8 | 10 | 20 |

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

| x | 50 | 60 | 70 | 80 |
|---|---|---|---|---|
| y | 205 | 225 | 248 | 274 |

[8+7]

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