Code No: R10107/R10

## Set No. 1

I B.Tech I Semester Supplementary Examinations, Oct/Nov 2013 MATHEMATICAL METHODS
( Common to Civil Engineering, Electrical \& Electronics Engineering,
Computer Science \& Engineering, Electronics \& Instrumentation
Engineering, Aeronautical Engineering, Bio-Technology and Automobile Engineering)

Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find rank of matrix using Echelon form $A=\left[\begin{array}{cccc}1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7\end{array}\right]$
(b) Solve the equations using Gauss Jordan method
$x+5 y+z=9, \quad 2 x+y+3 z=12, \quad 3 x+y+4 z=16$
2. Using Cayley - Hamilton theorem find $\mathrm{A}^{8}$ if $A=\left[\begin{array}{cc}1 & 2 \\ 2 & -1\end{array}\right]$
3. Reduce the quadratic form $6 x_{1}^{2}+3 x_{2}^{2}+3 x_{3}^{2}-4 x_{1} x_{2}+4 x_{1} x_{3}-2 x_{2} x_{3}$ to the sum of squares form by diagonalization and find the corsponding linear transformation. Also find the index and signature.
4. (a) Find a real root of the equation inx $+\cos x=0$, using Newton-Raphson's method
(b) Evaluate $\sqrt{12}$ and $\frac{1}{\sqrt{12}}$ usin? ${ }^{2}$ d point iteration method. $[8+7]$
5. (a) If the interval of differeing is unity, prove the following: $\triangle\left\{\frac{1}{f(x)}\right\}=-\frac{\Delta f(x)}{f(x) f(x+1)}$
(b) Given that $\sin 45{ }^{\circ} 0.7071, \sin 50^{\circ}=0.8192, \sin 60^{\circ}=0.8660$, find $\sin 48^{\circ}$.
[8+7]
6. (a) Computef $f^{\prime}(1)$ using the given data:

| X | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}(\mathrm{x})$ | 27 | 106.75 | 324 | 783.75 | 1621 |

(b) Using Simpson's $3 / 8^{\text {th }}$ rule evaluate $\int_{0}^{6} \frac{d x}{1+x^{2}}$ by dividing the range into 6 equal parts
7. (a) Solve $y^{1}=-x y^{2}, y(0)=2$ by modified Euler's method and hence find $y(0.1)$, y(0.2)
(b) Solve $\frac{d y}{d x}=\frac{y^{2}-x^{2}}{y^{2}+x^{2}}, \mathrm{y}(0)=1$ by fourth order R-K method and hence find $\mathrm{y}(0.2)$, $\mathrm{y}(\mathrm{o} .4)$
[8+7]
8. (a) Fit a least square parabola $y=a+b x+c x^{2}$ to the data $(-1,2),(0,1),(1,4)$
(b) By the method of least squares fit a straight line to the following data

| x | 5 | 10 | 15 | 15 | 20 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| y | 15 | 19 | 23 | 26 | 30 |

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## Set No. 2

I B.Tech I Semester Supplementary Examinations, Oct/Nov 2013 MATHEMATICAL METHODS
( Common to Civil Engineering, Electrical \& Electronics Engineering,
Computer Science \& Engineering, Electronics \& Instrumentation
Engineering, Aeronautical Engineering, Bio-Technology and Automobile Engineering)

Max Marks: 75
Time: 3 hours
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find rank of matrix using Echelon form $A=$
(b) Solve the equations using Gauss Jordan method
$\mathrm{x}_{1}+\mathrm{x}_{2}+\mathrm{x}_{3}=8,2 \mathrm{x}_{1}+3 \mathrm{x}_{2}+2 \mathrm{x}_{3}=19,4 \mathrm{x}_{1}+2 \mathrm{x}_{2}+3 \mathrm{x}_{3}=23$
2. Verify Cayley - Hamilton theorem and find $\mathrm{A}^{-1}$ if $A=$

$$
\left[\begin{array}{ccc}
1 & 0 & 3 \\
2 & 1 & -1 \\
1 & -1 & 1
\end{array}\right]
$$

3. (a) Find the nature of the quadratic form $5 x^{2}+y^{2}+14 z^{2}+2 x y-16 y z-8 z x$
(b) If $A=\left[\begin{array}{ll}1 & 0 \\ 0 & 3\end{array}\right]$ then find $A^{50}$
4. (a) Apply Newton-Raphson's formur find the cube root of 5 correct up to three decimal places starting fron
(b) Find a real root of $f(x)-3 x+1=0$ correct up to three decimal places starting with $\mathrm{x}=1$ b/<tative method.
$[8+7]$
5. The following table gins the population of a town during the last six censuses. Estimate, using NeNon's interpolation formula, the increase in the population during the period 1986 to 1988 .

| year | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Population <br> (in thousands) | 12 | 15 | 20 | 27 | 39 | 52 |

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 $\mathrm{x}=1.0$
(b) The table below shows the temperature $f(t)$ as a function of time

| $t$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{f}(\mathrm{t})$ | 81 | 75 | 80 | 83 | 78 | 70 | 60 |

7. (a) Solve $y^{1}=3 x^{2}+1$ by Euler's method and find $y$ at $x=2$ by taking $h=0.5$
(b) Solve by fourth order R-K method $y^{1}=x-y, y(1)=0.4$ and hence find $y(1.2)$
8. (a) Fit a curve of the type $y=a+b x+c x^{2}$ 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 $y=a b^{x}$ 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 |

Code No: R10107/R10

## Set No. 3

I B.Tech I Semester Supplementary Examinations, Oct/Nov 2013 MATHEMATICAL METHODS
( Common to Civil Engineering, Electrical \& Electronics Engineering,
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Engineering, Aeronautical Engineering, Bio-Technology and Automobile Engineering)

Max Marks: 75
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define rank and find the rank of matrix $A=$

Echelon form
(b) Find values of $\mathrm{x}, \mathrm{y}$ and z using Gauss Jordon method $2 \mathrm{x}+\mathrm{y}-\mathrm{z}=1$; $\mathrm{x}-\mathrm{y}+\mathrm{z}=2$ $5 x+5 y-4 z=3$
2. Find Eigen Vectors of $A=\left[\begin{array}{ccc}5 & -2 & 0 \\ -2 & 6 & 2 \\ 0 & 2 & 7\end{array}\right]$
3. (a) By Lagrange's reduction reduce the qu $\quad$ tic form $X^{T} A X$ to sum of squares form for $A=\left[\begin{array}{ccc}1 & 2 & 4 \\ 2 & 6 & -2 \\ 4 & -2 & 18\end{array}\right]$
(b) Find the values of $\mathrm{a}, \mathrm{b},{ }_{5}$ a $\quad b \quad-c$ is an orthogonal matrix $[8+7]$
4. (a) Find a real root ANe equation using Newton-Raphson's method $\operatorname{Cos}^{2} \mathrm{x}-\mathrm{x}=0$
(b) Find a root equation $\mathrm{x}^{3} \mathrm{e}^{x}-\mathrm{x}-1=0$ by Bisection method. [8+7]
5. (a) (i) Solve $\Delta\left(e^{a x} \log b x\right)$ (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 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{Y}=$ | 15.30 | 15.10 | 15.00 | 14.50 | 14.00 |
| $\mathrm{f}(\mathrm{x})$ |  |  |  |  |  |

6. (a) A curve is expressed by the following values of $x$ and $y$. Find the slope at the point $\mathrm{x}=0.5$.

| X | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| y | 1.58 | 1.80 | 2.04 | 2.33 | 2.65 |

Calculate the angular velocity and the angular acceleration of the rod when $t$ $=0.3$ seconds.
(b) Evaluate $\int_{0}^{1} \frac{1}{1+x} d x$, by Trapezoidal rule and Simpson's $\frac{1}{3}$ rule.
7. Solve $y^{1}=x-y, y(0)=1, h=0.1$ by Milne's predictor corrector method to find $y(0.4)$. Use Euler's modified method to evaluate $y(0.1), y(0.2), y(0.3)$
8. (a) Fit a power curve $y=a x^{b}$ to the following data

| X | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Y | 7.1 | 27.8 | 62.1 | 110 | 161 |

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

| x | 0 | 1 | 2 | 3 | 4 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| y | 1 | 5 | 10 | 22 | 38 |

Code No: R10107/R10

## Set No. 4

I B.Tech I Semester Supplementary Examinations, Oct/Nov 2013 MATHEMATICAL METHODS
( Common to Civil Engineering, Electrical \& Electronics Engineering, Computer Science \& Engineering, Electronics \& Instrumentation Engineering, Aeronautical Engineering, Bio-Technology and Automobile Engineering)

Max Marks: 75
Time: 3 hours
Answer any FIVE Questions
All Questions carry equal marks

1. (a) Find rank of matrix $A=$
(b) Solve system of equations, if consistent $x+y+2 z=4,2 x-y+3 z=9,3 x-y-z=2$
2. Show that matrix $A=\left[\begin{array}{ccc}0 & c & -b \\ -c & 0 & \mathrm{a} \\ \mathrm{b} & -\mathrm{a} & 0\end{array}\right]$ satisfies Cayley - Hamilton theorem [15]
3. Find the rank, signature and index of the quadratic form $2 x_{1}^{2}+x_{2}^{2}-3 x_{3}^{2}+12 x_{1} x_{2}-$ $4 x_{1} x_{3}-8 x_{2} x_{3}$ by reducing it to normad 18 . Also write the linear transformation which brings about the normal reduoin [15]
4. (a) Find a real root of the eqtion $x \sin x+\cos x=0$, using Newton-Raphson's method
(b) Evaluate $\sqrt{12}$ and $\frac{\Omega}{\sqrt{12}}$ using fixed point iteration method. $[8+7]$
5. (a) Evaluate the fand interval of differencing being unity. $\triangle \tan ^{-1}$ ax (ii) $\triangle\left(e^{2 x} \log 3 x\right.$
(b) Find $\mathrm{y}(25)$, given that $\mathrm{y}_{20}=24, \mathrm{y}_{24}=32, \mathrm{y}_{28}=35, \mathrm{y}_{32}=40$, Using Gauss forward difference Interpolation formula.
6. (a) For the function $\mathrm{y}=\mathrm{f}(\mathrm{x})$ given by the following Table, find $y^{\prime}$ at $\mathrm{x}=0.04$ using the Bessel's formula.

| x | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| y | 0.1023 | 0.1047 | 0.1071 | 0.1096 | 0.1122 | 0.1148 |

(b) Evaluate $\int_{0}^{4} e^{1 / x} d x$ by using the Simpson's $3 / 8^{\text {th }}$ rule, by dividing the interval into 3 equal parts.
[8+7]
7. (a) Solve $\mathrm{y}^{1}=3 \mathrm{x}^{2}+1$ by Euler's method and find y at $\mathrm{x}=2$ by taking $\mathrm{h}=0.5$
(b) Solve by fourth order R-K method $y^{1}=x-y, y(1)=0.4$ and hence find $y(1.2)$
8. (a) Fit a least square parabola $\mathrm{y}=\mathrm{a}+\mathrm{bx}+\mathrm{cx}^{2}$ to the following data

| $x$ | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 2 | 3 | 5 | 8 | 10 |

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

| x | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| y | 10 | 9 | 7 | 5 | 4 | 3 | 0 | -1 |

