

Code No: R10206/R10

Set No. 1

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
 (Common to Mechanical Engineering, Electronics & Communication Engineering, Chemical Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Mining and Petroleum Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
 All Questions carry equal marks

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. 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 $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to the canonical form by orthogonal reduction. Also find its nature and Signature [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) 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]

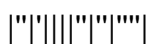
6. (a) The population of a certain town (as obtained from census data) is shown in the following table:

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

- (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



Code No: R10206/R10

Set No. 1

Using Simpson's rule, determine the distance moved by the train in 40 seconds.
[8+7]

7. (a) Solve $y' = 1 + xy$ subject to the condition $y(0) = 1$ by Taylor series method and hence find $y(0.2)$
 (b) Solve $y' = x + y + xy$ subject to the condition $y(0) = 1$ by Picard's method and hence find $y(0.1)$ [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]



Code No: R10206/R10

Set No. 2

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
 (Common to Mechanical Engineering, Electronics & Communication
 Engineering, Chemical Engineering, Bio-Medical Engineering, Information
 Technology, Electronics & Computer Engineering, Mining and Petroleum
 Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
 All Questions carry equal marks

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

(b) Solve system of equations, if consistent $x+y+2z=4$, $2x-y+3z=9$, $3x-y-z=2$
[7+8]

2. Using Cayley – Hamilton theorem find A^8 if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ [15]

3. Find the transformation which will transform $4x^2 + 3y^2 + z^2 - 8xy - 6yz + 4zx$ into a sum of square and find the reduced form [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) Using the Gauss forward interpolation formula, find the value of $\log_{10} 347.5$ from the following table

x	320	330	340	350	360
Y= \log_{10}	2.5052	2.5185	2.5315	2.5441	2.5563

(b) Compute the approximate value of $e^{0.35}$, using the following table:

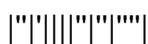
x	0	0.1	0.2	0.3	0.4
e^x	1.0000	1.1052	1.2214	1.3499	1.4918

[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



Code No: R10206/R10

Set No. 2

(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 $y' = 1 - y$ subject to the condition $y(0) = 0$ by Taylor series method hence find $y(0.1)$, $y(0.2)$

(b) Solve $y' = 1 + y^2$ subject to the condition $y(0) = 0$ by Picard's method [8+7]

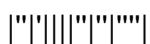
8. (a) Fit a least square parabola $y = a + bx + cx^2$ to the following data

x	1	2	3	4	5
y	2	3	5	8	10

(b) Find the best fit of the type $y = ae^{bx}$ to the data by the method of least squares

x	1	1.2	1.4	1.6
y	40.17	73.196	133.372	243.02

[8+7]



Code No: R10206/R10

Set No. 3

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
 (Common to Mechanical Engineering, Electronics & Communication
 Engineering, Chemical Engineering, Bio-Medical Engineering, Information
 Technology, Electronics & Computer Engineering, Mining and Petroleum
 Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
 All Questions carry equal marks

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. (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. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy - 2yz + 2zx$ to the canonical form by orthogonal reduction. Also find its nature and Signature [15]
 4. (a) Prove that $\sqrt[n]{a}$ can be evaluated by using the iterative procedure
 $x_{n+1} = \frac{1}{b} \left\{ (b-1)x_n + \frac{a}{x_n^{b-1}} \right\}$ and hence find $\sqrt[3]{2}$
 - (b) Find the real root of the equation $x^3 - x - 1 = 0$ by Bisection method. [7+8]
 5. (a) Prove the following. (i) $\Delta \nabla = \Delta - \nabla$ (ii) $\Delta E = E \nabla = \nabla$
 - (b) From the following table of values of $y = f(x)$, find $f(0.53)$, using the Newton's backward interpolation formula.
- | | | | | |
|--------|--------|--------|--------|--------|
| x | 0.30 | 0.40 | 0.50 | 0.60 |
| Y=f(x) | 0.6179 | 0.6554 | 0.6915 | 0.6915 |
- [8+7]
6. (a) From the following data find $f'(0.5)$
- | | | | | | | |
|------|---|---|----|---|---|---|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| f(x) | 4 | 8 | 15 | 7 | 6 | 2 |
- (b) Evaluate $\int_0^1 e^{-x^2} dx$ taking $h=0.2$ using
 (i) Simpson's $\frac{1}{3}$ rd rule (ii) Trapezoidal rule. [8+7]
 7. (a) Solve $y' = 1-y$, $y(0)=0$ by Euler's method and find y at $x=0.1, 0.2$
 - (b) Solve $y' = y-x$, $y(0)=2, h=0.2$, by fourth order R-K method and hence find $y(0.2)$ [7+8]

Code No: R10206/R10

Set No. 3

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]



Code No: R10206/R10

Set No. 4

I B.Tech II Semester Supplementary Examinations, Feb/Mar 2014
MATHEMATICAL METHODS
 (Common to Mechanical Engineering, Electronics & Communication Engineering, Chemical Engineering, Bio-Medical Engineering, Information Technology, Electronics & Computer Engineering, Mining and Petroleum Technology)

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
 All Questions carry equal marks

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

(b) Solve system of equations, if consistent $x+y+2z=4$, $2x-y+3z=9$, $3x-y-z=2$ [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. Determine the diagonal matrix diagonally similar to the real symmetric matrix

$A = \begin{bmatrix} 2 & 0 & 4 \\ 0 & 6 & 0 \\ 4 & 0 & 2 \end{bmatrix}$ [15]

4. (a) solve the equation $x^3+2x^2+0.4=0$ using Newton's -Raphson's Method.

(b) Show that the iteration scheme $\phi(x) = \frac{-1}{x^2-3}$ converges and hence find a real root of $f(x)= x^3-3x+1=0$ near $x=3$. [8+7]

5. (a) (i) Solve $\Delta (e^{ax} \log bx)$ (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) For the following data, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (i) $x = 1.1$ and (ii) $x = 1.6$

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

(b) Evaluate $\int_2^{10} \frac{dx}{1+x}$ using (i) Trapezoidal and (ii) Simpson's $\frac{1}{3}$ rule, taking $h = 1.0$ and compare the results with the exact value [8+7]

Code No: R10206/R10

Set No. 4

7. (a) Solve $y' = x + \sin y$, $y(0) = 1$ by modified Euler's method and hence find $y(0.2)$, $y(0.4)$ with $h = 0.2$

(b) Solve $y' = 3x - 4y$, $y(0) = 2$, $h = 0.2$ find $y(0.4)$ by R-K method [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]

