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Code No: R10107/R10

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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)

Time: 3 hours

Max Marks: 75

# Answer any FIVE Questions All Questions carry equal marks

- (a) Find rank of matrix using Echelon form  $A = \begin{bmatrix} 1 & 2 & -4 & 5 \\ 2 & -1 & 3 & 6 \\ 8 & 1 & 9 & 7 \end{bmatrix}$ 1.
  - (b) Solve the equations using Gauss Jordan method x+5y+z=9, 2x+y+3z=12, 3x+y+4z=16|7+8|
- 2. Using Cayley Hamilton theorem find  $A^8$  if  $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ 15
- 3. Reduce the quadratic form  $6x_1^2 + 3x_2^2 + 3x_3^2 4x_1x_2 + 4x_1x_3 2x_2x_3$  to the sum of squares form by diagonalization and find the consponding linear transformation. Also find the index and signature Also find the index and signature.
- (a) Find a real root of the equation x = 0, using Newton-Raphson's 4.
  - (b) Evaluate  $\sqrt{12}$  and  $\frac{1}{\sqrt{12}}$  using fixed point iteration method. [8+7] (a) If the interval of different ng is unity, prove the following:  $\Delta \left\{\frac{1}{f(x)}\right\} = -\frac{\Delta f(x)}{f(x)f(x+1)}$

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

(a) Compute f'(1) using the given data: 6.

Х	1.0	1.5	2.0	2.5	3.0
f(x)	27	106.75	324	783.75	1621

- (b) Using Simpson's  $3/8^{th}$  rule evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by dividing the range into 6 equal
- (a) Solve  $y^1 = -xy^2$ , y(o) = 2 by modified Euler's method and hence find y(o.1), 7.
  - (b) Solve  $\frac{dy}{dx} = \frac{y^2 x^2}{y^2 + x^2}$ , y(o)=1 by fourth order R-K method and hence find y(o.2), [8+7]
- 8. (a) Fit a least square parabola  $y = a+bx+cx^2$  to the data (-1,2),(0,1),(1,4)



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(b) By the method of least squares fit a straight line to the following data

X	5	10	15	15	20
У	15	19	23	26	30

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Time: 3 hours

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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. 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) Find the nature of the quadratic form  $5x^2$ ,  $y^2 + 14z^2 + 2xy - 16yz - 8zx$ (b) If  $A = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$  then find  $A^{50}$  [8+7]

- 4. (a) Apply Newton-Raphson's formula to find the cube root of 5 correct up to three decimal places starting from x = 1.
  - (b) Find a real root of f(x) = 3x + 1 = 0 correct up to three decimal places starting with x=1 by the ative method. [8+7]
- 5. The following table gives the population of a town during the last six censuses. Estimate, using Newton's interpolation formula, the increase in the population during the period 1986 to 1988.

y	ear	1911	1921	1931	1941	1951	1961	r	
P (i	opulation in thousands)	12	15	20	27	39	52		15

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

Х	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 on	d second	dorivative	ng at w —	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	n's 1/3 r	nethod 1	to estim	ate $\int_{1}^{7} f$	(t) dt.			[8+7



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- 7. (a) Solve  $y^1=3x^2+1$  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+7]

8. (a) Fit a curve of the type  $y = a+bx+cx^2$  to the following data

Х	10	15	20	25	30	35
У	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

Y         98.2         91.7         81.3         64         36.4         32.6         7.1         11.3         [7+8]	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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Time: 3 hours

Max Marks: 75

## Answer any FIVE Questions All Questions carry equal marks

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1. (a) Define rank and find the rank of matrix  $A = \begin{bmatrix} 1 & 3 & 6 & -1 \\ 1 & 4 & 5 & 1 \\ 1 & 5 & 4 & 3 \end{bmatrix}$  using

#### Echelon form

(b) Find values of x,y and z using Gauss Jordon method 2x+y-z=1; x-y+z=2; 5x+5y-4z=3 [7+8]

2. Find Eigen Vectors of 
$$A = \begin{bmatrix} 5 & -2 & 0 \\ -2 & 6 & 2 \\ 0 & 2 & 7 \end{bmatrix}$$
 [15]

3. (a) By Lagrange's reduction reduce the quadratic form  $X^T A X$  to sum of squares form for  $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 6 & -2 \\ 4 & -2 & 18 \end{bmatrix}$ .

(b) Find the values of a, b, 
$$c$$
  $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$  is an orthogonal matrix [8+7]

4. (a) Find a real root of the equation using Newton-Raphson's method Cos<sup>2</sup>x-x=0
(b) Find a root of the equation x<sup>3</sup>e<sup>x</sup>- x-1=0 by Bisection method. [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.

	Х	1	2	3	4	5	
ĺ	Y =	15.30	15.10	15.00	14.50	14.00	[8+7
	f(x)						

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

Х	0.4	0.5	0.6	0.7	0.8
У	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.



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- (b) Evaluate  $\int_0^1 \frac{1}{1+x} dx$ , by Trapezoidal rule and Simpson's  $\frac{1}{3}$  rule. [8+7]
- 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) [15]
- 8. (a) Fit a power curve  $y=ax^b$  to the following data

Х	1	2	3	4	5
Y	7.1	27.8	62.1	110	161

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

X	0	1	2	3	4	[7   8]
У	1	5	10	22	38	

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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. Show that matrix 
$$A = \begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$$
 satisfies Cayley – Hamilton theorem [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) Find a real root of the equation x sinx +cosx=0, using Newton-Raphson's method
  - (b) Evaluate  $\sqrt{12}$  and  $\frac{1}{\sqrt{12}}$  using fixed point iteration method. [8+7]
- 5. (a) Evaluate the following, interval of differencing being unity.  $\triangle \tan^{-1} ax$  (ii)  $\triangle (e^{2x} \log 3x)$ 
  - (b) Find y(25), given that  $y_{20} = 24$ ,  $y_{24} = 32$ ,  $y_{28} = 35$ ,  $y_{32} = 40$ , Using Gauss forward difference Interpolation formula. [8+7]
- 6. (a) For the function y = f(x) given by the following Table, find y' at x = 0.04 using the Bessel's formula.

X 0.01 0.0.	2 0.03	0.04	0.05	0.06
y 0.1023 0.1	047 0.1071	0.1096	0.1122	0.1148

- (b) Evaluate  $\int_0^4 e^{1/x} dx$  by using the Simpson's  $3/8^{th}$  rule, by dividing the interval into 3 equal parts. [8+7]
- 7. (a) Solve  $y^1=3x^2+1$  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+7]



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

X	1	2	3	4	5
У	2	3	5	8	10

(b)	Fit a straight	line of the	form y=	a+bx to	the following	data
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X	-1	0	1	2	3	4	5	6	[8+7]
У	10	9	7	5	4	3	0	-1	

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