

**MATHEMATICS – III**

(Common to CE, CSE, IT, ME, EEE, ECE &amp; EIE)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Find the rank of the matrix  $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{pmatrix}$ .

(b) Express the matrix  $A = \begin{pmatrix} 1+i & 2 & 5-5i \\ 2i & 2+i & 4+2i \\ -1+i & -4 & 7 \end{pmatrix}$  as the sum of Hermitian matrix and Skew-Hermitian matrix.

(c) State the underlying principle of false position method.

(d) Find the Newton-Raphson iterative formula for  $\frac{1}{N}$ .

(e) State Gauss's forward interpolation formula.

(f) State Stirling's interpolation formula.

(g) Reduce  $y = a \cdot x^b$  into linear form and write its normal equation.(h) Write down the formula for  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at any point that are derived from Newton's forward interpolation formula.

(i) Explain Picard's method.

(j) Find  $y(0.1)$  if  $\frac{dy}{dx} = x - y^2$ ,  $y(0) = 1$  by Euler's method.**PART – B**

(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

2 Diagonalise the matrix  $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{pmatrix}$ .

**OR**3 Reduce the quadratic form  $x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 + 2x_2x_3$  to canonical form and also find its corresponding linear transform.**UNIT – II**4 (a) Find the root of  $x^3 - 2x - 5 = 0$  by Regula-Falsi method.

(b) Solve the system of equations using Gauss-Seidel method:

$$x + y + 54z = 110; \quad 27x + 6y - z = 85; \quad 6x + 15y + 2z = 72$$

**OR**5 (a) Find the real root of  $3x - \cos x - 1 = 0$  by Newton's Raphson method.

(b) Solve the system of equation by Crout's method:

$$3x + y + z = 4; \quad x + 4y - z = -5; \quad x + y - 6z = -12$$

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## UNIT – III

- 6 (a) From the following data find
- $y(43)$
- .

x:	40	50	60	70	80	90
y:	184	204	226	250	276	304

- (b) Find
- $f(0.37)$
- using Bessel's formula from the following data:

x:	0.1	0.2	0.3	0.4	0.5
y:	0.0998	0.1986	0.2955	0.3894	0.4794

OR

- 7 (a) Use Lagrange's method find
- $y(40)$
- .

x:	30	35	45	55
y:	148	96	68	34

- (b) Find the value of
- $y$
- at
- $x = 2.9$
- from the following data using Gauss's backward formula.

x:	2.0	2.5	3.0	3.5	4.0
y:	246.2	409.3	537.2	636.3	715.9

## UNIT – IV

- 8 (a) Find the straight line that best fits the following data:

x:	1	2	3	4	5
y:	14	27	40	55	68

- (b) Obtain the value of
- $f'(105)$
- using the following data:

x:	60	75	90	105	120
$f(x)$ :	28.2	38.2	43.2	40.9	37.7

OR

- 9 (a) Fit a second degree parabola to the following data:

x:	10	12	15	23	20
y:	14	17	23	25	21

- (b) Evaluate
- $\int_0^1 \frac{dx}{1+x}$
- by trapezoidal rule dividing the range into eight equal parts.

## UNIT – V

- 10 (a) Given
- $\frac{dy}{dx} = 3x + \frac{y}{2}$
- ,
- $y(0) = 1$
- find
- $y(0.1)$
- using Taylor's series method.

- (b) Given
- $\frac{dy}{dx} = \frac{y-x}{y+x}$
- ,
- $y(0) = 1$
- find
- $y(0.2)$
- by Runge-Kutta method.

OR

- 11 Solve
- $U_{xx} + U_{yy} = 0$
- in
- $0 \leq x \leq 4$
- ,
- $0 \leq y \leq 4$
- given that
- $u(0, y) = 0$
- ;
- $u(4, y) = 12 + y$
- ,
- $u(x, 0) = 3x$
- and
- $u(x, 4) = x^2$
- , take
- $h = k = 1$
- .

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