

**MATHEMATICS – II**  
(Common to CE and ME)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

\*\*\*\*\*

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

(a) Define symmetric matrix and if  $\begin{bmatrix} 3 & a & b \\ -2 & 2 & 4 \\ 7 & 4 & 5 \end{bmatrix}$  is symmetric, then (a, b) = -----(b) If  $A = \begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & b & c \end{bmatrix}$  is orthogonal then ( $|a|, |b|, |c|$ ) =

(c) Newton's iterative formula for finding the cube root of a number N is -----

(d) Write Lagrange's formula and find  $y(1)$  from the data

x	0	2	3
y	3	1	2

(e) Find  $y'(1.2)$  if  $x_0 = 1.2$ ,  $\rho = 0$ ,  $h = 0.2$ ,  $\Delta y_0 = 0.416$ ,  $\Delta^2 y_0 = 0.336$  and  $\Delta^3 y_0 = 0.048$ .

(f) Write Milne's predictor corrector formula.

(g) The Euler's integral formula for the constants  $a_n$  for the function  $f(x)$  defined in the interval  $(0, 2l)$  is ---(h) The Fourier cosine transform of  $f(x) = e^{-ax}$  ( $x \geq 0, a \geq 0$ ) is -----(i) The partial differential equation of all planes whose  $x$  and  $y$  intercepts are always equal is -----(j) The partial differential equation obtained by eliminating  $a$  and  $b$  from  $z = (x^2 + a^2)(y^2 + b^2)$  is -----**PART – B**

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

**UNIT - I**2 Show that  $A = \begin{bmatrix} i & 0 & 0 \\ 0 & 0 & i \\ 0 & i & 0 \end{bmatrix}$  is Skew-Hermitian and also unitary. Find its Eigen values and Eigen vectors.

OR

3 Reduce the quadratic form  $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$  by orthogonal transformation. Find rank signature and nature.**UNIT - II**4 Find the cubic polynomial  $y_x$  which takes on the values:  $y_0 = -5, y_1 = 1, y_2 = 9, y_3 = 25, y_4 = 55, y_5 = 105$ . Use the difference table to calculate  $y_{3.2}$ .

OR

5 Fit an exponential curve of the form  $y = ab^x$  for the data:

x	1	2	3	4
y	7	11	17	27

**UNIT - III**6 Find the approximate area bounded by the curve  $y = \sqrt{1-x^2}$  and the  $x$ -axis by: (i) Trapezoidal rule. (ii) Simpson's 1/3 rule.

OR

7 Apply R-K 4<sup>th</sup> order method to find  $y(0.1)$  where  $\frac{dy}{dx} = x + y, y(0) = 1$ .**UNIT - IV**8 Find the Fourier series of the function  $f(x) = e^{ax}$  in  $(0, 2\pi)$ .

OR

9 Find the Fourier transform of  $f(x) = \begin{cases} 1-x^2 & |x| \leq 1 \\ 0 & |x| > 1 \end{cases}$ . Hence evaluate  $\int_0^\infty \frac{x \cos x - \sin x}{x^3} \cos \frac{x}{2} dx$ .**UNIT - V**10 Form the partial differential equation by eliminating arbitrary function:  $yz + zx + xy = f\left(\frac{z}{x+y}\right)$ .

OR

11 An insulated rod of length  $\ell$  has its ends A and B maintained at  $0^\circ\text{C}$  and  $100^\circ\text{C}$  respectively. Until steady state conditions prevail. If 'B' is suddenly reduced to  $0^\circ\text{C}$  and maintained at  $0^\circ\text{C}$ , find the temperature at a distance  $x$  from A at time  $t$ .

\*\*\*\*\*