3RD SEM. /AE &IE / ELE.& MECH/ EEE/ ELE. / EE(I & C)/ ETC& COMM./ E & TC/ 2023(W) NEW

Th-1 Engineering Mathematics-III

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. Find the value of $(\omega + \omega^2)^{97}$ *where* ω *is the cube root of unity.*

   b. Find the value of $A + 2B$, *where* $A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ *and* $B = \begin{bmatrix} 1 & 3 \\ 1 & -2 \end{bmatrix}$

   c. Write down the formula for Simpsons $\frac{1}{3}$ rule having space width is h

   d. Form a partial differential equation by eliminating arbitrary constant of $Z = ax + by$

   e. Find C.F if $D^2y + 5Dy + 6y = 0$

   f. Explain Interpolation with an example.

   g. State Linearity property of Laplace Transforms

   h. Define even function with an example

   i. Evaluate $\Delta(x + \cos x)$

   j. Find $L(e^{3t}t^2)$

2. Answer **Any Six** Questions 5 X 6

   a. Find Rank of matrix $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$

   b. Solve $\frac{d^3y}{dx^3} - y = 0$

   c. Find the Laplace transforms of $tcos^2t$

   d. Find root of equation $x^3 - 2x - 5 = 0$ upto 4 stages which lies between 2 and 3 by using Bisection method.

   e. If $x + \frac{1}{x} = 2\cos\theta$, *then show that* $x^n + \frac{1}{x^n} = 2\cos n\theta$

   f. Prove that $\Delta\{\log f(x)\} = \log\left\{1 + \frac{\Delta f(x)}{f(x)}\right\}$

g Using Inverse Lagrange's Interpolation formula , find the value of $x\ when\ y = 15\ from\ the\ following\ data$

x	5	6	9	11
y	12	13	14	16

3 Expand $F(x) = |x|\ as\ a\ fourier\ series\ in\ the\ interval$ $-\pi \le x \le \pi, Hence\ deduce\ that\ \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}\ldots\ldots=\frac{\pi^2}{8}$ 10

4 a) Applying Newton's Forward Interpolation formula, find a cubic polynomial from the following data. 5

x	0	1	2	3
y	1	2	1	10

b) Find the square root of $3 + 4i$ 5

5 a) Solve $(D^2 - 3D + 2)y = e^{3x} + \sin 2x$ 5

b) Find the value of $y\ when\ x = 10\ from\ following\ data$ 5

x	5	15	25	35
y	9	30	35	42

6 a) Integrate Numerically $\int_0^6 \frac{dx}{1+x^2}$, using Trapezoidal Rule taking $h = 1$ 5

b) Find $L^{-1}\left(\log\frac{s+1}{s+2}\right)$ 5

7 Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$ 10