III-SEM./ELECTRICAL/ ETE/MECHANICAL /AUTO/AE & IE/CSE/IT
/EEE/MECH(IND INTG)/ ELECTRICAL(INST &CTRL)/ 2021(W)
BST-301   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.   State Rouche's Theorem.

   b.   Solve $(D^2 + 1)y = 0$

   c.   Frame a partial differential equation for the function
        $z = (x - a)^2 + (y - b)^2$

   d.   What is Gamma function? Find $\Gamma(-3.5)$

   e.   Find $L^{-1}\left(\frac{3}{s+3}\right)$

   f.   Define even and odd functions with examples.

   g.   Write Newton Raphson formula to find $\sqrt{N}$.

   h.   Evaluate $\Delta^2(e^x)$

   i.   State Newton Cotes Quadrature Formula.

   j.   Define Rank of a matrix.

2.   Answer **Any Six** Questions   5X6

   a.   Find the root of the equation $x^3 - x - 1 = 0$ correct to three places
        of decimal using Bisection Method.

   b.   Find the Laplace Transform of
        $f(t) = \begin{cases} t, & 0 \le t < 3 \\ 5, & t \ge 3 \end{cases}$

   c.   State the Convergence condition of Fourier Series.
        Find a_0 of $f(x) = e^x$ $in - \pi < x < \pi$

   d.   Evaluate $\int_1^3 \frac{1}{x} dx$ using Trapezoidal Rule taking h= 0.5

   e.   Find f(2.8) using Newton's Backward Interpolation Formula

x	0	1	2	3
F(x)	1	2	11	34

f. Solve $(D^2 + 3D + 2)y = xe^x \sin x$

g   Find the rank of the matrix $\begin{pmatrix} -1 & -2 & 3 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{pmatrix}$ by Row reduced Echelon form.

3   i) Find the Fourier Series of $f(x) = x + x^2 in\ (-\pi, \pi)$ 6

    ii) Solve $(D^2 - 10D + 25)y = 0$ 4

4   i) Check the consistency and solve by Matrix method   5
        2x+y+z=5
        x+ y+z=4
        x-y+2z=1

    ii) Evaluate $\int_2^6 \frac{1}{1+x^3} dx$ using Simpson's $\frac{1}{3}rd$ rule and taking h =1   5

5   i) Solve the following partial differential equation   5
        $x(y - z)p + y(z - x)q = z(x - y)$

    ii) Find $L(t \sin 3t)$ 5

6   i) Solve by Transform Method   6
        $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t$ with $x = 2, \frac{dx}{dt} = -1\ at\ t = 0$

    ii) Solve $(D^2 - 1)y = x^2 e^x$ 4

7   i) Using Interpolation estimate the output of a factory in 1986 from   5
        the following data

year	1974	1978	1982	1990
Output in 1000 tones	25	60	80	170

    ii) Find the Inverse Laplace Transform of $L^{-1}(log \frac{s^2+1}{s(s+1)})$ 5