

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 Rouché'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 $f(t) = \begin{cases} t, & 0 \leq t < 3 \\ 5, & t \geq 3 \end{cases}$
- 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 $(D^2 - 1)y = x^2e^x$ 4
- 7 i) Using Interpolation estimate the output of a factory in 1986 from the following data 5
- | | | | | |
|----------------------|------|------|------|------|
| year | 1974 | 1978 | 1982 | 1990 |
| Output in 1000 tones | 25 | 60 | 80 | 170 |
- ii) Find the Inverse Laplace Transform of $L^{-1}\left(\log \frac{s^2+1}{s(s+1)}\right)$ 5