III-SEM./ELECTRICAL/ETE/AE&IE/EME/ ELECTRICAL[PT]
/EEE/ELECTRICAL(INST & CTRL)/ECE/2021(W)
TH-I 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. What are homogeneous equations? State the condition to get non-trivial solutions for homogeneous equations.
b. Find Particular Integral of $(D^2 + 16)y = e^{-4x}$.
c. Frame a differential equation for the function $z = f\left(\frac{xy}{z}\right)$.
d. Write the Existence Theorem of Laplace Transform.
e. Find $L^{-1}\left\{\frac{2S}{S^2-9}\right\}$.
f. Define Periodic function. Give one example of periodic function with its period.
g. Write Newton Raphson Formula to find a root of equation $f(x) = 0$.
h. Evaluate $\Delta(ab^{cx})$.
i. State Trapezoidal Rule. Why this is called Trapezoidal Rule?
j. Express $\frac{3i}{4-i}$ in the form of $a + ib$.

2. Answer **Any Six** Questions 5x6

a. Find the root of the equation $2x^3 - 2x - 5 = 0$ correct to 3-places of decimal by Newton Raphson Method.
b. Find the Laplace Transform of $f(t) = cos^2(3t)$
c. State Dirichlet's condition for a function to be expanded in Fourier Series. Find a_0 $of\ the\ Fourier\ Series\ for\ the\ function\ f(x) = 2$ In $0 \leq x \leq 2\pi$.
d. Evaluate $\int_{2.5}^{4} lnx\, dx$ using Trapezoidal Rule with 5 subintervals.
e. Find the Inverse Laplace Transform of
$F(s) = \frac{1}{(s+1)(s^2-1)}$

f. Find $f(x)$ when x=32 from the following data using Newton Forward Interpolation Formula

x	30	35	40	45	50
f(x)	15.9	14.9	14.1	13.3	12.5

g Solve the following differential equation
$(D^3 - 7D + 6)y = 0$

3 i) Express $f(x) = \frac{1}{2}(\pi - x)$ as a Fourier Series in the interval $(0,2\pi)$ 7
Hence deduce the value of the series $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$

ii) Find $\sqrt{-15 + 8i}$ 3

4 i) Solve the following partial differential equation 6
$x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

ii) Evaluate $\int_0^6 \frac{dx}{4x+5}$ using Simpson's $\frac{1}{3}rd$ Rule correct up to 3-places of decimal taking h=1. 4

5 i) Solve the differential equation 5
$(D^2 + 5D + 6)y = e^{-2x} \sin 2x$

ii) Find the Laplace Transform of $L(t^3e^{-3t})$ 5

6 i) Find k if the following equations are consistent 5
X+2y-3z=-2
3x-y-2z=1
2x+3y-5z=k

ii) Find f(x) when x=15

x	3	7	11	19
F(x)	42	43	47	60

5

7 i) Solve the following differential equation 5
$(D^2 - 2D - 3)y = e^{3x} + \sin x$

ii) If ω is the cube root of unity, show that 5
$(1 - \omega + \omega^2)^6 + (1 + \omega - \omega^2)^6 = 128$