ANURAG Engineering College
(An Autonomous Institution)
II B.Tech I Semester Supplementary Examinations, Jan/Feb-2024
MATHEMATICS – III
(COMMON TO EEE & ECE)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)
Answer All Questions

		Course Outcome	B.T Level	Mark
1.	Find $L\{e^{at}\sin t\}$.	CO1	L1	2M
2.	State Convolution theorem.	CO1	L1	3M
3.	If $f(x) = x^2$ in $(0, 2\pi)$ then find the Fourier coefficient a_0.	CO2	L2	2M
4.	If $f(x)$ is an function in $(-l, l)$ then what is value of Fourier coefficient a_n	CO2	L1	3M
5.	State Fourier Integral theorem.	CO3	L1	2M
6.	If $F_c[f(x)] = F_c(s)$ then find $F_c[f(ax)]$.	CO3	L1	3M
7.	Derive a formula to find the square root of a number N by Newton-Raphson method.	CO4	L2	2M
8.	Write the Newton's backward formula.	CO4	L1	3M
9.	Write the formula for Trapezoidal rule.	CO5	L1	2M
10.	Given $\dfrac{dy}{dx} = x + y,\ y(0) = 1$, find correct to four decimal places the value of $y(0.1)$ by using Euler's method	CO5	L2	3M

Section B (Essay Questions)
Answer all questions, each question carries equal marks. (5 X 10M = 50M)

		Course Outcome	B.T Level	Mark
11. A)	i) State and prove second shifting theorem.	CO1	L3	5M
	ii) Find $L\left\{\dfrac{\cos 2t - \cos 3t}{t}\right\}$			5M

OR

		Course Outcome	B.T Level	Mark
B)	Using Laplace transform, Solve $(D^2 + 4D + 5)y = 5$, given that $y(0) = 0, y''(0) = 0$.	CO1	L3	10M

		Course Outcome	B.T Level	Mark
12. A)	Find the half range sine series for $f(x) = x(\pi - x)$ in $0 < x < \pi$. Deduce that $\dfrac{1}{1^3} + \dfrac{1}{3^3} + \dfrac{1}{5^3} + \ldots = \dfrac{\pi^2}{32}$.	CO2	L3	10M

OR

		Course Outcome	B.T Level	Mark
B)	Find the Fourier series for $f(x) = \dfrac{(\pi - x)}{2}$ in $0 < x < 2$.	CO2	L3	10M

13.
A)
Using Fourier integral show that
$$\int_0^\infty \frac{1-\cos\lambda x}{\lambda}\sin\lambda x\,d\lambda = \begin{cases} \frac{\pi}{2}, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$$

CO3   L3   10M

OR

B)
Find Fourier cosine transform of $\dfrac{e^{-ax}-e^{-bx}}{x}, a,b > 0$.

CO3   L3   10M

14.
A) Find the negative root of the equation $x^3 - 4x + 9 = 0$ using bisection method.

CO4   L3   10M

OR

B)
The population of a city in a census taken once in ten years is given below. Estimate the population in the year 1895.

Year	1891	1901	1911	1921	1931
Population in thousands	46	66	81	93	101

CO4   L3   10M

15.
A)
Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range into 6 equal parts using

i) Simpson's $\frac{1}{3}^{rd}$ rule and   ii) Simpson's $\frac{3}{8}^{th}$ rule.

CO5   L3   10M

OR

B)
Use Runge-Kutta method to evaluate $y(0.1)$ given that $\frac{dy}{dx} = x^2 - y, y(0) = 1$

CO5   L3   10M