

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, June/July - 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	Marks
1. State first shifting theorem.	CO1	L1	2M
2. Find $L^{-1}\left\{\frac{3s}{4s^2 + 25}\right\}$.	CO1	L1	3M
3. Write Dirichlet conditions.	CO2	L1	2M
4. If $f(x) = x - \pi$ in $(-\pi, \pi)$ then find the Fourier coefficient a_0 .	CO2	L2	3M
5. If $F_s[f(x)] = F_s(s)$ then find $F_s[af(ax)]$.	CO3	L1	2M
6. State Convolution theorem in Fourier Transform.	CO3	L1	3M
7. Derive a formula to find the P^{th} root of a number N by Newton-Raphson method.	CO4	L2	2M
8. Write the Newton's forward interpolation formula.	CO4	L1	3M
9. Write the formula for Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule.	CO5	L1	2M
10. Solve numerically using Euler's method Given $\frac{dy}{dx} = y^2 + x, y(0) = 1$, find the value of $y(0.1)$.	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks.

(5 X 10M = 50M)

11. A)	CO1	L3	5M
i) Find $L\{te^{3t} \sin 2t\}$			
ii) Using Laplace transform, evaluate $\int_0^{\infty} \frac{\cos at - \cos bt}{t} dt$			5M
OR			
B)	CO1	L3	10M
Using Convolution theorem, Find $L^{-1}\left\{\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right\}$			
12. A)	CO2	L3	10M
Obtain the Fourier series expansion of $f(x)$ given that $f(x) = (\pi - x)^2$ in $(0, 2\pi)$ and deduce that value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$			

OR

B) $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & 0 \leq x \leq \pi \end{cases}$ CO2 L3 10M
 Is even?

i) If So , find the Fourier Series for the function.

ii) Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

13. A) Using Fourier integral show that CO3 L3 10M

$$e^{ax} - e^{bx} = \frac{2(b^2 - a^2)}{\pi} \int_0^{\infty} \frac{\lambda \sin \lambda x}{(\lambda^2 + a^2)(\lambda^2 + b^2)} d\lambda \quad a, b > 0$$

OR

B) If $F[f(x)] = F(s)$ then prove that CO3 L3 10M

$$F[f(x) \cos ax] = \frac{1}{2} [F(s - a) + F(s + a)]$$

14. A) Find a root of $e^x \sin x = 1$ using Regula Falsi method. CO4 L3 10M

OR

B) Using Lagrange's formula fit a polynomial in the data CO4 L3 10M

x	-1	0	2	3
$f(x)$	-12	-8	6	11

And also find $f(1)$.

15. A) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Trapezoidal and Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. CO5 L3 10M

OR

B) Solve $\frac{dy}{dx} = x^2 - y, y(0) = 2$ using R-K method to find $y(0.1)$. CO5 L3 10M