Sub Code: BAST301/BEST301/BCET301 **ROLL NO……..……..**

ODD SEMESTER EXAMINATION, 2024 – 25

2nd Year (3rd Sem) B.Tech.

MATHEMATICS- III

Duration: 3:00 hrs **Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any two parts of the following.	(10x2= 20)
	a) (i) Find the Fourier transform of $f(x) = \begin{cases} 1-x^2, & for\ \|x\| \le 1 \\ 0 & for\ \|x\| > 1. \end{cases}$	(5 marks)
	(ii) Find the Fourier sine transform of $f(x) = \frac{e^{-ax}}{x}$.	(5 marks)
	b) Express the function $f(x) = \begin{cases} 1, & When\ \|x\| \le 1 \\ 0, & When\ \|x\| > 1. \end{cases}$ As a Fourier integral. Hence evaluate $\int_0^\infty \frac{\sin\lambda \cos\lambda}{\lambda}\, d\lambda$.	(10 marks)
	c) Solve $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$ for $0 \le x < \infty$, $t > 0$ given the condition (i) $u(x, 0) = 0$ for all $x \ge 0$ (ii) $\frac{\partial u}{\partial x}(0, t)$ = -a (constant) (iii) u(x, t) is bounded.	(10 marks)
Q 2.	Answer any two parts of the following.	(10x2= 20)
	a) (i) Obtain the Laplace transform of $t^2 e^t \sin 4t$.	(5 marks)
	(ii) Find the inverse Laplace transform of $\frac{s+4}{s\,(s-1)\,(s^2+4)}$.	(5 marks)
	b) Find the Laplace transform of periodic function and find the Laplace transform of the following periodic function with period $\frac{2\pi}{\omega}$ defined as $f(t) = \begin{cases} \sin\omega t, & 0 \le t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} \le t \le \frac{2\pi}{\omega} \end{cases}$	(10 marks)
	c) Using Laplace transforms, find the solution of initial value problem $y'' - 4y' + 4y = 64 \sin 2t$, $y(0) = 0$, $y'(0) = 1$.	(10 marks)
Q 3.	Answer any two parts of the following.	(10x2= 20)
	a) (i) By using Newton – Raphson's method find the root of $x^4 - x - 10 = 0$, which is near to x = 2 correct to three places of decimal.	(5 marks)
	(ii). Given f(0) = 3, f(1) = 12, f(2) = 81, f(3) = 200, f(4) = 100 and f(5) = 8. Form a difference table	

and find $\Delta^5 f(0)$. (5 marks)

b) Given values

x	5	7	11	13	17
F(x)	150	392	1452	2366	5202

Find the value f(9) by using Lagrange's formula. (10 marks)

c) Estimate the sale for 1966 using the following table by Newton-Gregory formula

Year	1931	1941	1951	1961	1971	1981
Sale in Thousand	12	15	20	27	39	52

(10 marks)

Q 4. Answer any two parts of the following. (10x2= 20)

a) (i) Calculate the value of the integral $\int_4^{5.2} \log x \ dx$ by Trapezoidal rule. (5 marks)

(ii) Using Milne predictor formula find y when x = 0.8 given $\frac{dy}{dx} = x - y^2$, y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762. (5 marks)

d) b) Find $\int_0^1 \frac{dx}{1+x^2}$ by using

(i). Simpson's $\frac{1}{3}$ rule

(ii). Simpson's $\frac{3}{8}$ rule (10 marks)

c) Given $\frac{dy}{dx} = y - x$, y(0) = 2. Find, using Runge-Kutta fourth order formula y (0.1) and y (0.2) correct to four decimal place. (10 marks)

Q 5. Answer any two parts of the following. (10x2= 20)

a) (i) Define Skewness and its type. Calculate Karl Pearson's coefficient of skewness for distribution having mean=3.41, median = 3.4 and S. D. =0.70. (5 marks)

(ii) Define Kurtosis. For a distribution the second and fourth central moments are 2 and 17 respectively. Find the moment coefficient of Kurtosis. (5 marks)

b) Obtain the regression equation Y on X by least square method for the following data, also estimate the value of Y when X = 10.

x	1	2	3	4	5
y	9	9	10	12	11

(10 marks)

c) Fit a least square geometric curve $y = ax^b$ for the following data

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

(10 marks)

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