CLASS: IMSc   SEMESTER : III
BRANCH: MATHS &   COMPUTING   SESSION : MO/2023

SUBJECT: MA208 INTEGRAL TRANSFORM AND APPLICATIONS
TIME: 02 Hours   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL

Q.1(a) Find the Fourier Series of $f(x) = \begin{cases} \pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$.   [3]   CO-1   BT-1

Q.1(b) Hence deduce that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \ldots\ldots\ldots$ [2]   CO-1   BT-2

Q.2 Express the following function as Fourier half range cosine and sine series :   [5]   CO-1   BT-2
$f(x) = x + x^2, \quad 0 < x < 1$

Q.3(a) Solve the integral using Laplace Transform   [2]   CO-2   BT-3
$$\int_0^\infty t e^{-2t} \cos 3t \, dt$$

Q.3(b) Show that: [3]   CO-2   BT-3

$$L\left\{\int_t^\infty \frac{\cos u}{u} \, du\right\} = \frac{1}{2s} \log(1 + s^2)$$

Q.4(a) Find the following using convolution theorem: [2]   CO-2   BT-1
$$L^{-1}\left\{\frac{1}{(s^2 + \omega^2)^2}\right\}$$

Q.4(b) Evaluate: [3]   CO-2   BT-3

$$L^{-1}\left\{\log\left(1 + \frac{1}{s^2}\right)\right\}$$

Q.5 Using the Laplace transform technique, solve the following Initial value problem: [5]   CO-2   BT-3
$$y'' + 4y = t, \quad y(0) = 1, \quad y'(0) = 6$$

:::::22/09/2023 E:::::