SASTRA
ENGINEERING · MANAGEMENT · LAW · SCIENCES · HUMANITIES · EDUCATION
DEEMED TO BE UNIVERSITY
(U/S 3 OF THE UGC ACT, 1956)
THINK MERIT | THINK TRANSPARENCY | THINK SASTRA

SASHE/Common for All branches
B.Tech – IV semester
Second CIA Test – May' 2022
Course Code: MAT 301 R01
Course Name: Engineering Mathematics - IV
Duration: 90 minutes Max Marks: 50

PART A 10 x 2 = 20 Marks

1.	Express the Fourier transform of $ke^{-xt}, t > 0$ in terms of Laplace transform.
2.	Write the kernel of the Fourier transform.
3.	Write the condition for the existence of Fourier transform of the second derivative function.
4.	Define: Self-reciprocal.
5.	State : Parseval's identity on Fourier transform.
6.	Find the Sine transform of (1/x).
7.	Find the function whose cosine transform is e^{-as}/s .
8.	Find the Fourier transform of Dirac-delta function.
9.	Find the finite Fourier Cosine transform of Unity in $(0, \pi)$.
10.	Derive the Newton-Raphson scheme to evaluate the reciprocal of a number k.

PART B 3 x 10 = 30 Marks
Answer any THREE Questions

11.	A chip is a signal that sweeps in frequency and is used in radar by bats and humans to facilitate the sorting out of the emitted signal from the echo under conditions where the first echoes will be returning while the emission is still continuing. The chip signal f(x) is given by a triangular wave $\begin{cases} 1-\lvert x\rvert, if \lvert x\rvert \le 1 \\ 0, Otherwise \end{cases}$ Using Fourier transform, evaluate $\int_0^\infty \frac{Sin^4 t dt}{t^4}$.
12.	In spectroscopy the equivalent which of a spectral line is defined as the width of a rectangular profile which has the same central intensity and the same area as the line. Using infinite Fourier transform find the value of width function f(x) equals to $e^{-x^2/2}$ and write your comment on this.
13.	Solve the following Boundary Value Problem using Fourier transform: $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ Subject to the conditions $u(0,t) = 0 = u(4,t)$ & $u(x,0) = 2x, 0 < x < 4$.
14.	In a given Electrical network, the equations for the currents I_1, I_2, I_3 are given by $2I_2I_3 - I_1I_3 + I_1I_2 = 3I_1I_2I_3,$ $3I_2I_3 + 4I_1I_2 + 2I_1I_3 = 19I_1I_2I_3,$ $7I_1I_3 + 6I_2I_3 - I_1I_2 = 17I_1I_2I_3$ Find the currents by Gauss-Jordan method.