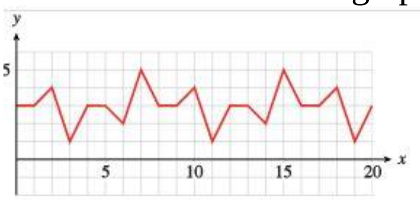
Reg.No: | | | | | | |

SNS College of Technology,Coimbatore-35.
(An Autonomous Institution)
Internal Assessment -I
Academic Year 2022-2023 (Odd)
Third Semester
Department of Mathematics
19MAT201- Transforms and Partial Differential Equations

A

Time: 1.30 Hours **Maximum Marks: 50**

PART – A (5 x 2 = 10 MARKS)
ANSWER ALL QUESTIONS

		CO	BLOOMS
1.	State Dirichlet's Condition.	CO1	(Rem)
2.	Determine the RMS value of the function f(x) = $x - x^2$ in $-1 < x < 1$.	CO1	(Und)
3.	Define even function with an example.	CO1	(Und)
4.	Determine whether the graph is periodic or not. Justify. 	CO1	(Und)
5.	State Fourier Transform pair.	CO2	(Rem)

PART –B (2 x13= 26 MARKS)
ANSWER ALL QUESTIONS

6. a)i) Determine the Fourier Series for the function CO1 (App) (7)

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi < x < 0 \\ 1 - \frac{2x}{\pi}, & 0 < x < \pi \end{cases}$$

ii) Express $f(x) = x, 0 < x < l$ as a Half range Fourier Sine Series of periodicity $2l$. CO1 (App) (6)

(or)

	b)	Find the Fourier Series of f(x) = x^2 in $-\pi < x < \pi$ and simplify the values to i. $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \cdots = \frac{\pi^2}{12}$ ii. $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \cdots = \frac{\pi^4}{90}$	CO1	(App) (13)
7.	a)	Determine the Fourier transform of f(x) = $\begin{cases} 1 - \lvert x\rvert, & \lvert x\rvert < 1 \\ 0 & , \lvert x\rvert > 1 \end{cases}$, and deduce that $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt = \frac{\pi}{2}$ and $\int_0^\infty \left(\frac{\sin t}{t}\right)^4 dt = \frac{\pi}{3}$.	CO2	(Ana) (13)
		(or)		
	b)	Show that the Fourier transform of f(x) = $\begin{cases} a^2 - x^2, & \lvert x\rvert < a \\ 0, & \lvert x\rvert > a \end{cases}$, where a$>$ 0 is $2\sqrt{\frac{2}{\pi}}\left[\frac{\sin as - as\cos as}{s^3}\right]$and deduce that $\int_0^\infty \frac{sin\ t - t\cos t}{t^3}\, dt = \frac{\pi}{4}$ and $\int_0^\infty \left(\frac{sin\ t - t\ cos\ t}{t^3}\right)^2 dt = \frac{\pi}{15}$	CO2	(Ana) (13)

PART – C (1x14 = 14 MARKS)

8.	a)i)	Apply Harmonic Analysis to find the Fourier Series upto second harmonic of period 2π for y = f(x) defined in $(0,2\pi)$ by means of the values given below	CO1	(Ana) (7)

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1.0	1.4	1.9	1.7	1.5	1.2	1.0

	ii)	Obtain the Fourier Series for the function f(x) = |x| in $-\pi < x < \pi$.	CO1	(Ana) (7)
		(or)		
	b)i)	Find the Fourier transform of the function f(x) = $\begin{cases} 1, & \lvert x\rvert < a \\ 0, & \lvert x\rvert > a \end{cases}$	CO2	(App) (7)
	ii)	Bring out the applications of Fourier transforms in various Engineering fields.	CO2	(App) (7)

Rem/Und: Remember/ Understand **App:** Apply **Ana:** Analyze **Eva:** Evaluate **Cre:** Create