Reg.No: | | | | | | | |

SNS College of Technology, Coimbatore-35.

(An Autonomous Institution)

Internal Assessment -I

Academic Year 2023-2024 (Odd)

Third Semester

19MAT201– TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(REGULATION 2019)

B

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

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

		CO	Blooms
1.	Compute a_0 for $f(x)=\frac{\pi-x}{2}$ in $(0,\pi)$.	CO1	(App)
2.	Recall Harmonic Analysis.	CO1	(Rem)
3.	Calculate the root mean square value of $f(x)=x^2$ in $(0,\pi)$.	CO1	(Und)
4.	Find the Fourier Transform for $f(x)=\begin{cases}1 & ,\lvert x\rvert\le 1\\ 0 & ,otherwise\end{cases}$	CO2	(App)
5.	State Parseval's identity for the Fourier Transform.	CO2	(Rem)

PART –B (13+13+14 = 40 MARKS)
ANSWER ALL QUESTIONS

6.	a) i)	Expand the Fourier series for the function $f(x)=(l-x)^2$ in $(0, 2\,l)$	CO1	(App) (7)
	ii)	Obtain the half range Fourier Sine series for $f(x)=x(\pi-x)$ in $0\le x\le\pi$	CO1	(App) (6)
		(OR)		
	b)	Develop the Fourier transform of $f(x)=\begin{cases}1-\lvert x\rvert & ,\lvert x\rvert\le 1\\ 0 & ,\lvert x\rvert>1\end{cases}$	CO2	(App) (13)
		Hence deduce that (i) $\int_0^\infty\left(\frac{\sin t}{t}\right)^2 dt=\frac{\pi}{2}$ (ii) $\int_0^\infty\left(\frac{\sin t}{t}\right)^4 dt=\frac{\pi}{3}$.		
7.	a)	Construct the Fourier series for $f(x)=x^2$ in $-\pi\le x\le\pi$ and hence deduce that	CO1	(App) (13)
		(i) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-.....\infty=\frac{\pi^2}{12}$		
		(ii) $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.....\infty=\frac{\pi^2}{8}$		

(OR)

b) i) Obtain the half range Fourier sine series for $f(x)=\begin{cases} x & ,0<x<1 \\ 2-x & ,1<x<2 \end{cases}$ CO1 (App) (7)

ii) Expand the Fourier series for the function $f(x)=x$ in $-\pi \le x \le \pi$ CO1 (App) (6)

8. a) Determine the Fourier transform of $f(x)=\begin{cases} a^2-x^2 & ,|x|\le a \\ 0 & ,|x|>a \end{cases}$ CO2 (App) (14)

Hence deduce that (i) $\int_0^\infty \left(\frac{\sin t - t\cos t}{t^3}\right)dt=\frac{\pi}{4}$ (ii) $\int_0^\infty \left(\frac{\sin t - t\cos t}{t}\right)^2 dt=\frac{\pi}{15}$

(OR)

b) The following values of y give the displacement in inches of certain machine part for the rotation x of the fly wheel. Expand y in terms a Fourier Series upto second harmonic: CO1 (Ana) (14)

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

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

Cre: Create