SRM Institute of Science and Technology

Ramapuram Campus

Department of Mathematics

Question Bank of Module-2(Fourier Series)

(2020–2021-ODD)

Subject.Code: 18MAB201T

Subject.Name: Transforms and Boundary Value Problems

Year/Sem: II/III **Part-A(1*20=20)** **Branch: Common to All branches**

Module-2(Fourier Series) **1*20=20**

1.	$\sin x$ is a periodic function with period (a) π (b) $\frac{\pi}{2}$ (c) 2π (d) 4π	ANS - **c**	(CLO-2, Remember)
2.	Which one of the following function is an even function (a) (a) $\sin x$ (b) x (c) e^x (d) x^2	ANS - **d**	(CLO-2, Remember)
3.	$\int_{-a}^{a} f(x)dx = 0$ if f(x) is (a)odd (b) even (c) periodic (iv) zero	ANS- **a**	(CLO-2, Remember)
4.	$\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$ if f(x) is (a) even (b) odd (c) neither even nor odd (iv) periodic	ANS - **a**	(CLO-2, Remember)
5.	$\int_{-\pi}^{\pi} \lvert x \rvert dx$ is equal to (a) $2\int_{0}^{\pi} xdx$ (b) 0 (c) $2\int_{0}^{\pi} (-x)dx$ (iv) $4\int_{0}^{\pi/2} xdx$	ANS - **a**	(CLO-2, Remember)

6.	$\tan x$ is a periodic function with period (a) π (b) 2π (c) 3π (d) $\pi/2$	ANS - **a**	(CLO-2, Remember)
7.	The constant a_0 of the Fourier series for the function f(x) = x is $0 \le x \le 2\pi$ (a) 2π (b) π (c) 3π (d) 0	ANS - **b**	(CLO-2, Apply)
8.	The constant a_0 of the Fourier series for the function f(x) = k, $0 \le x \le 2\pi$ (a) k (b) 2k (c) 0 (d) $\frac{k}{2}$	ANS - **b**	(CLO-2, Apply)
9.	If f(x) is an odd function in $(-l, l)$ then value of a_n in the Fourier series expansion of f(x) is (a) $\frac{2}{l}\int_0^l f(x)\cos nx\,dx$ (b) 0 (c) $\frac{2}{l}\int_0^l f(x)\sin nx\,dx$ (d) $\frac{1}{l}\int_{-l}^{l} x\,dx$	ANS – b	(CLO-2, Remember)
10.	If f(x) is an even function in $(-\pi, \pi)$ then the value of b_n in the Fourier series expansion of f(x) is (a) $\frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\cos nx\,dx$ (b) $\frac{2}{\pi}\int_0^{\pi} f(x)\cos nx\,dx$ (c) 0 (d) $\frac{2}{\pi}\int_{-\pi}^{\pi} f(x)\sin nx\,dx$	ANS – **c**	(CLO-2, Remember)
11.	The RMS value of f(x) in $a \le x \le b$ is (a) 0 (b) $\sqrt{\frac{\int_a^b [f(x)]^2 dx}{b-a}}$ (c) $\sqrt{\frac{\int_a^b [f(x)]^2 dx}{b+a}}$ (d) $\sqrt{\frac{\sqrt{\int_a^b f(x)dx}}{b-a}}$	ANS – b	(CLO-2, Remember)
12.	The RMS value of f(x) = x in $-1 \le x \le 1$ is (a) 1 (b) 0 (c) $\frac{1}{\sqrt{3}}$ (d) -1	ANS – **c**	(CLO-2, Apply)
13.	If $\bar{y}$ is the RMS value of f(x) in $(0, 2l)$ then $\frac{a_0^2}{4} + \frac{1}{2}\sum_{n=1}^{\infty}(a_n^2 + b_n^2)$ is	ANS –	(CLO-2, Remember)

	(a) $\frac{\bar{y}^2}{2}$ (b) $\bar{y}$ (c) $\frac{\bar{y}}{2}$ (d) $\bar{y}^{-2}$	**d**	
14.	Half range cosine series for f(x) in $(0,\pi)$ is (a) $\frac{a_0}{2}+\sum_{n=1}^{\infty}a_n\cos nx$ (b) $\frac{a_0^2}{4}+\frac{1}{2}\sum_{n=1}^{\infty}(a_n^2+b_n^2)$ (c) $\sum_{n=1}^{\infty}b_n\sin nx$ (d) $\sum_{n=1}^{\infty}a_n\cos nx$	ANS – **a**	(CLO-2, Remember)
15.	Half range sine series for f(x) in $(0,\pi)$ is (a) $\sum_{n=1}^{\infty}a_n\cos nx$ (b) $\frac{a_0}{2}+\sum a_n\cos nx$ (c) $\sum_{n=1}^{\infty}b_n\sin nx$ (d) $\frac{a_0}{2}-\sum a_n\cos nx$	ANS - **c**	(CLO-2, Remember)
16.	The function defined by $f(x)=\begin{cases}x, & -\pi\le x\le 0\\ -x, & 0\le x\le\pi\end{cases}$ is (a) odd (b) neither odd nor even (c) periodic (d) even	ANS- **d**	(CLO-2, Remember)
17.	The function $f(x)=\begin{cases}g(x), & 0\le x\le\pi\\ -g(-x), & -\pi\le x\le 0\end{cases}$ is (a) even function (b) odd function (c) increasing function (d) periodic function	ANS - **b**	(CLO-2, Remember)
18.	The value of Fourier series of f(x) in $0<x<2\pi$ at x = 0 is (a) f(0) (b) $f(2\pi)$ (c) $\frac{f(0)+f(2\pi)}{2}$ (d) 0	ANS- **c**	(CLO-2, Remember)
19.	A function f(x) with period T if (a) $f(x+T)=f(T)$ (b) $f(x+T)=f(x)$ (c) $f(x+T)=-f(x)$ (d) $f(x+T).f(x)=0$	ANS- **b**	(CLO-2, Remember)
20.	An example for a function which neither even nor odd (a) $x\sin x$ (b) e^{ax} (c) $x^2\sin x$ (d) $x\cos x$	ANS- **b**	(CLO-2, Apply)
21.	Write the formula for finding Euler's constant of a_0 Fourier series in $(0,2\pi)$		

	$a)\ a_0 = \frac{1}{\pi}\int_0^{2\pi} f(x)dx \qquad b)\ a_0 = \frac{2}{\pi}\int_0^{2\pi} f(x)dx$ $c)\ a_0 = \frac{l}{\pi}\int_0^{2\pi} f(x)dx \qquad d)\ a_0 = \frac{1}{2\pi}\int_0^{2\pi} f(x)dx$	Ans (a)	(CLO-2 Remember)
22.	Sum the Fourier series for $f(x) = \begin{cases} x & 0 < x < 1 \\ 2 & 1 < x < 2 \end{cases}$ at $x = 0$ (a) 2 (b) 1 (c) 3 (d)0	Ans (b)	(CLO-2 Remember)
23.	Sum the Fourier series for $f(x) = \begin{cases} x & 0 < x < 1 \\ 2 & 1 < x < 2 \end{cases}$ at $x = 1$ (a) $\frac{1}{3}$ (b) $\frac{1}{6}$ (c) $\frac{3}{2}$ (d) $\frac{1}{4}$	Ans (c)	(CLO-2 Remember)
24.	What is the constant term a_0 and the coefficient of cosnx, a_n in the Fourier series expansion of $f(x) = x - x^3$ in $(-\pi, \pi)$? (a) $\frac{\pi}{3}, 0$ (b) $0, \pi$ (c) $0, \frac{\pi}{2}$ (d) 0,0	Ans (d)	(CLO-2 Remember)
25	Write the formula for finding Euler's constant of a_n Fourier series in $(0,2\pi)$ $a)\ a_n = \frac{1}{2\pi}\int_0^{2\pi} f(x)\cos nxdx \qquad b)\ a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos nxdx$ $c)\ a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\sin nxdx \qquad d)\ a_n = \frac{1}{\pi}\int_0^{\pi} f(x)\cos nxdx$	Ans (b)	(CLO-2 Remember)
26.	State Parseval's Identity for full range expression of $f(x)$ as Fourier series in $(0,2l)$ $a)\frac{1}{2l}\int_0^{2l}[f(x)]^2 dx = \frac{a_0^2}{4} + \frac{1}{2}\sum_1^{\infty}(a_n^2 + b_n^2)$ $b)\frac{1}{l}\int_0^{l}[f(x)]^2 dx = \frac{a_0^2}{4} + \frac{1}{2}\sum_1^{\infty}(a_n^2 + b_n^2)$ $c)\frac{1}{l}\int_0^{2l}[f(x)]^2 dx = \frac{a_0^2}{2} + \frac{1}{2}\sum_1^{\infty}(a_n^2 + b_n^2)$ $d)\frac{1}{2l}\int_0^{2l}[f(x)]^2 dx = \frac{a_0^2}{4} + \frac{1}{4}\sum_0^{\infty}(a_n^2 + b_n^2)$		
27	What is the constant term a_0 and the coefficient of cosnx, a_n in the Fourier series expansion of $f(x) = x^3$ in $(-\pi, \pi)$? (a)0,0 (b) $\pi, 1$ (c) $\frac{\pi}{2}, 0$ (d) $\frac{\pi}{3}, 0$	Ans (a)	(CLO-2 Remember)

28	Write the formula for finding Euler's constant of b_n Fourier series in $(0,2\pi)$ $a) b_n = \frac{1}{2\pi}\int_0^{\pi} f(x)\sin nx dx$ $b)\ b_n = \frac{1}{\pi}\int_0^{\pi} f(x)\sin nx dx$ $c) b_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\sin nx dx$ $d)\ b_n = \frac{1}{2\pi}\int_0^{\pi} f(x)\sin nx dx$	Ans (c)	(CLO-2 Remember)
29.	Find a Fourier sine series for the function $f(x)=1$; $0<x<\pi$. $a)\ \frac{4}{\pi}\sum_{n=1,3,5}^{\infty}\frac{\sin nx}{n}$ $b)\ \frac{4}{\pi}\sum_{n=1}^{\infty}\frac{\sin nx}{n}$ $c)\ \frac{4}{3\pi}\sum_{n=1,3,5}^{\infty}\frac{\sin nx}{2n}$ $d)\ \frac{2}{\pi}\sum_{n=1,3,5}^{\infty}\frac{\sin nx}{n}$	Ans (a)	(CLO-2 Remember)
30	Find a_n in expanding e^{-x} as Fourier series in $(-\pi, \pi)$ $a)\ \frac{(-1)^{n+1}}{(1+n^2)}2\cosh\pi$ $b)\ \frac{(-1)^n}{(1+n^2)}\cosh\pi$ $c)\ \frac{(-1)^n}{\pi(1+n^2)}2\cosh\pi$ $d)\ \frac{(-1)^{n+1}}{\pi(1+n^2)}\cosh\pi$	Ans (c)	(CLO-2 Remember)
31	Find the value of a_n for f(x)= c in (0,10) in cosine series expansion (a) 10 (b) c (c) c/10 (d)0	Ans (d)	(CLO-2 Remember)
32	If f(x) is an odd function defined in $(-l, l)$ what are the values of a_0 and a_n.? (a) 0,0 (b) 0,2l (c) 2l,0 (d)1,1	Ans (a)	(CLO-2 Remember)
33	Find b_n in the expansion of cosx as a Fourier series in $(-\pi, \pi)$ (a) $\frac{\pi}{3}$ (b) π (c) $\frac{\pi}{2}$ (d) 0	Ans (d)	(CLO-2 Remember)
34	Find a_0 in the expansion of f(x) = $\begin{cases} -\pi, -\pi < x < 0 \\ x, 0 < x < \pi \end{cases}$ (a) $\frac{\pi}{2}$ (b) π (c) $-\frac{\pi}{2}$ (d) $-\pi$	Ans (c)	(CLO-2 Remember)
35	finding Euler's constant of a_0 for f(x) = $\frac{1}{2}(\pi - x)$ in $-\pi < x < \pi$ (a) $\frac{\pi}{3}$ (b) π (c) $\frac{\pi}{2}$ (d) 0	Ans (b)	(CLO-2 Remember)
36	Find the fourier constant a_n of periodicity 3 for f(x) = $2x-x^2$ in $0<x<3$	Ans	(CLO-2

	$\boldsymbol{a})\left(\frac{-3}{n^3\pi^2}\right)$ $b)\left(\frac{9}{n^3\pi^2}\right)$ $c)\left(\frac{-9}{n^2\pi^2}\right)$ $d)\left(\frac{9}{n^2\pi^2}\right)$	(c)	Remember)