

IAT-1(QUESTIONS & ANSWERS) IN 18MAT31 ON FOURIER SERIES ON 9th SEPTEMBER, 2020

1. The function $f(x) = x^2 - 1$ in $(-\pi, \pi)$ is

- a) odd
- b) even
- c) both odd and even
- d) neither odd nor even

Answer : b CO1, L1

2. The function $f(x) = x - 1$ in $(-\pi, \pi)$ is

- a) odd
- b) even
- c) both odd and even
- d) neither odd nor even

Answer : d CO1, L1

3. The function $f(x) = \sin x$ in $(-\pi, \pi)$ is

- a) odd
- b) even
- c) both odd and even
- d) neither odd nor even

Answer : a CO1, L1

4. The function $f(x) = 0$ in $(-\pi, \pi)$ is

- a) odd
- b) even
- c) both odd and even
- d) neither odd nor even

Answer : c CO1, L2

5. Which of the following functions will have $b_n = 0$ in its Fourier series?

- a) $f(x) = x$ in $(-1, 1)$
- b) $f(x) = kx^2$ in $(-\pi, \pi)$ where k is a constant
- c) $f(x) = x + x^2$ in $(-\pi, \pi)$
- d) $f(x) = \exp(-ax)$ in $(-\pi, \pi)$

Answer : b CO1, L2

6. Which of the following functions will have $a_n = 0$ in its Fourier series?

- a) $f(x) = x \sin x$ in $(-\pi, \pi)$
- b) $f(x) = |x|$ in $(-\pi, \pi)$
- c) $f(x) = x \cos x$ in $(-\pi, \pi)$
- d) $f(x) = \cosh(ax)$ in $(-\pi, \pi)$

Answer : c CO1, L2

7. The value of a_0 in the Fourier series of $f(x) = |\sin x|$ is

- a) $\frac{1}{\pi}$
- b) $\frac{2}{\pi}$
- c) $\frac{4}{\pi}$
- d) $\frac{8}{\pi}$

Answer : c CO1, L2

8. A function which is symmetric with respect to the y axis is called as

- a) odd
- b) even
- c) both odd and even
- d) neither odd nor even

Answer : b(even) CO1, L1

9. In harmonic analysis, the constant term and the nth harmonic of a function defined in $(0, 2\pi)$ is

a) a_0 and $a_n \cos(nx) + b_n \sin(nx)$

b) $\frac{a_0}{2}$ and $a_n \cos(nx) + b_n \sin(nx)$

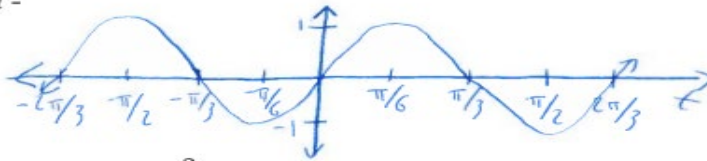
c) a_0 and $a_n \cos(nx)$

d) a_0 and $b_n \sin(nx)$

Answer : b CO1, L1

10.

Solution -



a) For the above graph, the function is $f(t) = \sin(3t)$ and the period is $\frac{2\pi}{3}$.

b) For the above graph, the function is $f(t) = \cos(3t)$ and the period is $\frac{2\pi}{3}$.

c) For the above graph, the function is $f(t) = \sin(3t)$ and the period is $\frac{\pi}{3}$.

d) none of the above

Answer : a CO1, L2

11. The value of a_n in the Fourier expansion of $f(x) = \exp(-ax)$ in $(-\pi, \pi)$ is

a) $\frac{2a(-1)^n}{\pi(a^2 + n^2)} \sinh(a\pi)$

b) $\frac{2n(-1)^n}{\pi(a^2 + n^2)} \cosh(a\pi)$

c) none of the above

Answer : a CO1, L3

12. The value of b_n in the Fourier expansion of

$$f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases} \text{ is}$$

- a) $\frac{4k}{n\pi}, n \text{ is odd}$
- b) $\frac{2k}{n\pi}$
- c) 0
- d) None of the above

Answer : a CO1, L3

13. The half range sine series of $f(x) = x$ in $(0, \pi)$ is

- a) $x = 2 \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin(nx)$
- b) $x = 2 \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \cos(nx)$
- c) $x = 4 \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin(nx)$
- d) none of the above

Answer : a CO1, L3

14. The half range cosine series of $f(x) = (x-1)^2$ in $(0,1)$ is

- a) $\frac{1}{3} + \frac{4}{\pi^2} \sum_{n=1}^{\infty} \frac{1}{n^2} \cos(nx)$
- b) $\frac{2}{3} + \frac{4}{\pi^2} \sum_{n=1}^{\infty} \frac{1}{n^2} \cos(nx)$
- c) $\frac{2}{3} + \frac{1}{\pi^2} \sum_{n=1}^{\infty} \frac{1}{n^2} \cos(nx)$
- d) none of the above

Answer : a or d CO1, L3

15. The Fourier series expansion of $f(x) = x \cos x$ in $(0, 2\pi)$ is

a) $x \cos x = \pi + \frac{1}{2} \sin x + 2 \sum_{n=2}^{\infty} \frac{n}{1-n^2} \sin(nx)$

b) $x \cos x = \pi \cos x - \frac{1}{2} \sin x + 2 \sum_{n=1}^{\infty} \frac{n}{1-n^2} \sin(nx)$

c) $x \cos x = \pi \sin x - \frac{1}{2} \cos x + 2 \sum_{n=1}^{\infty} \frac{n}{1-n^2} \sin(nx)$

d) none of the above

Answer : b CO1, L3

16. The Fourier series representing the function

$$f(x) = \begin{cases} 0, & -2 < x < 0 \\ a, & 0 < x < 2 \end{cases} \text{ is}$$

a) $a \left\{ \frac{1}{2} + \frac{1}{\pi} \sum_{n=1}^{\infty} \frac{1}{n} \left(1 - (-1)^n \right) \sin \left(\frac{n\pi x}{2} \right) \right\}$

b) $a \left\{ \frac{1}{2} - \frac{1}{\pi} \sum_{n=1}^{\infty} \frac{1}{n} \left(1 - (-1)^n \right) \sin \left(\frac{n\pi x}{2} \right) \right\}$

c) $a \left\{ \frac{1}{2} - \frac{1}{\pi} \sum_{n=1}^{\infty} \frac{1}{n} \left(1 - (-1)^n \right) \cos \left(\frac{n\pi x}{2} \right) \right\}$

d) none of the above

Answer : a CO1, L3