SRM Institute of Science and Technology

Faculty of Engineering and Technology

Department of Mathematics

Question Bank- Fourier Series(Unit-2)

1. Any waveform can be expressed in Fourier series if
   A. Sampling conditions are satisfied
   B. Dirchiet conditions are satisfied
   C. Maxwell's conditions are satisfied
   D. None of the above conditions is required to be satisfied
   ANSWER: B

2. $sinx$ is a periodic function with period
   A. π
   B. $\frac{\pi}{2}$
   C. 2π
   D. 4π
   ANSWER: C

3. $tanx$ is a periodic function with period
   A. π
   B. $\frac{\pi}{2}$
   C. 2π
   D. 4π
   ANSWER: A

4. Which one of the following function is an even function
   A. e^x
   B. x
   C. $sinx$
   D. x^2
   ANSWER: D

5. Which one of the following function is neither even nor odd
   A. $xsinx$
   B. $cosx$
   C. e^x
   D. x
   ANSWER: C

6. If $\int_{-a}^{a} f(x)dx = 0$, then the function is
   A. odd
   B. even
   C. neither even nor odd
   D. periodic

ANSWER: A

7. If $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$, then the function is

   A. odd
   B. even
   C. neither even nor odd
   D. periodic

   ANSWER: B

8. If T is the period of $f(x)$, then period of $f(ax+b), a>0$ is

   A. aT
   B. $\frac{T}{a}$
   C. $\frac{a}{T}$
   D. T

   ANSWER: B

9. $cosx$ is a periodic function with period

   A. π
   B. $\frac{\pi}{2}$
   C. 4π
   D. 2π

   ANSWER: D

10. If $x=\alpha$ is a point of continuity of $f(x)$, then sum of the Fourier series is

    A. $f(\alpha)$
    B. $f(0)$
    C. $\frac{f(\alpha^-)+f(\alpha^+)}{2}$
    D. 0

    ANSWER: A

11. If $x=\alpha$ is a point of discontinuity of $f(x)\ in\ (0,2\alpha)$, then sum of the Fourier series is

    A. $f(\alpha)$
    B. $f(0)$
    C. $\frac{f(\alpha^-)+f(\alpha^+)}{2}$
    D. 0

    ANSWER: C

12. The constant a_0 of the Fourier series for the function $f(x)=x\ in\ 0\leq x\leq 2\pi$

    A. π
    B. 2π
    C. 3π
    D. 0

    ANSWER: B

13. The constant a_0 of the Fourier series for the function $f(x)=k\ in\ 0\leq x\leq 2\pi$

A. $2k$

B. $\frac{k}{2}$

C. k

D. 0

ANSWER: A

14. The value of b_n in the Fourier series expansion of $f(x) = x^2$, $(-\pi, \pi)$ is

A. π

B. $\frac{\pi}{2}$

C. $\frac{1}{\pi}$

D. 0

ANSWER: D

15. The value of a_n in the Fourier series expansion of $f(x) = x - x^3$, $(-\pi, \pi)$ is

A. π

B. $\frac{\pi}{2}$

C. $\frac{1}{\pi}$

D. 0

ANSWER: D

The value of a_0 in the Fourier series expansion of $f(x) = x$, $(-\pi, \pi)$ is

A. π

B. $\frac{\pi}{2}$

C. $\frac{1}{\pi}$

D. 0

16. If f(x) is an odd function in (-L,L), then value of b_n in the Fourier series expansion of f(x) is

A. $\frac{2}{L}\int_0^L f(x)dx$

B. $\frac{2}{L}\int_0^L f(x)cos(\frac{n\pi x}{L})dx$

C. $\frac{2}{L}\int_0^L f(x)sin(\frac{n\pi x}{L})dx$

D. 0

ANSWER: C

17. If f(x) is an even function in (-L,L), then value of a_n in the Fourier series expansion of f(x) is

A. $\frac{2}{L}\int_0^L f(x)dx$

B. $\frac{2}{L}\int_0^L f(x)cos(\frac{n\pi x}{L})dx$

C. $\frac{2}{L}\int_0^L f(x)sin(\frac{n\pi x}{L})dx$

D. 0

ANSWER: B

18. The root mean square value of $f(x)\ in\ a \leq x \leq b$ is

A. $\sqrt{\frac{\int_a^b f(x)dx}{b-a}}$

B. $\sqrt{\frac{\int_a^b f(x)dx}{a-b}}$

C. $\sqrt{\frac{\int_a^b [f(x)]^2dx}{b-a}}$

D. $\sqrt{\frac{\int_a^b [f(x)]^2 dx}{a-b}}$

ANSWER: C

19. The root mean square value of $f(x) = x^2 \ in \ (-\pi, \pi)$ is

A. $\frac{\pi^2}{\sqrt{5}}$
B. $\frac{\pi^2}{5}$
C. $\frac{\pi}{5}$
D. $\frac{1}{5}$

ANSWER: A

20. The root mean square value of $f(x) = x \ in \ (0, L)$ is

A. $\frac{L^2}{\sqrt{3}}$
B. 1
C. 0
D. $\frac{L}{\sqrt{3}}$

ANSWER: D

21. If $\bar{y}$ is the root mean square value of $f(x) \ in \ (0, 2L)$ then $\frac{a_0^2}{4} + \frac{1}{2}\sum(a_n^2 + b_n^2)$ is

A. $\bar{y}$
B. $\frac{\bar{y}}{2}$
C. $\bar{y}^2$
D. $\frac{\bar{y}^2}{2}$

ANSWER: C

22. Half range cosine series for f(x) in $(0, \pi)$ is

A. $\frac{a_0^2}{4} + \frac{1}{2}\sum(a_n^2 + b_n^2)$
B. $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \ cosnx$
C. $\sum_{n=1}^{\infty} a_n \ cosnx$
D. $\sum_{n=1}^{\infty} b_n \ sinnx$

ANSWER: B

23. Half range sine series for f(x) in $(0, \pi)$ is

A. $\frac{a_0^2}{4} + \frac{1}{2}\sum(a_n^2 + b_n^2)$
B. $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \ cosnx$
C. $\sum_{n=1}^{\infty} a_n \ cosnx$
D. $\sum_{n=1}^{\infty} b_n \ sinnx$

ANSWER: D

24. The value of Fourier series of f(x) in $(0, 2\pi)$ at x = 0 is

A. f(0)
B. $f(2\pi)$
C. $\frac{f(0)+f(2\pi)}{2}$
D. 0

ANSWER: C

25. The value of Fourier series of $f(x) = x^2 \ in \ 0 < x < 2$ at x = 1 is

    A. 0
    B. 1
    C. 2
    D. -1

    ANSWER: B

26. The value of Fourier series of $f(x) = x \ in \ 0 < x < 2l$ at x = 0 is

    A. 0
    B. 1
    C. $\frac{l}{2}$
    D. l

    ANSWER: D

27. The Fourier coefficient a_0 in the Fourier expansion of $f(x) = xsinx \ in \ 0 \leq x \leq 2\pi$ is

    A. -2
    B. 0
    C. 2
    D. -1

    ANSWER: A

28. The Fourier coefficient a_0 in the Fourier expansion of $f(x) = \left(\frac{\pi - x}{2}\right)^2 \ in \ (0, 2\pi)$ is

    A. $\frac{\pi^2}{3}$
    B. 0
    C. $\frac{\pi^2}{6}$
    D. $\frac{\pi^2}{2}$

    ANSWER: C

29. If the Fourier series Expansion of $f(x) = x^2 \ , \ -\pi < x < \pi$ is $\frac{\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} cosnx$, then the value of $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - ... + \infty$

    A. $\frac{\pi^2}{3}$
    B. $\frac{\pi^2}{4}$
    C. $\frac{\pi^2}{6}$
    D. $\frac{\pi^2}{12}$

    ANSWER: D

30. If the Fourier series Expansion of $f(x) = \pi^2 - x^2 \ , \ -\pi < x < \pi$ is $\frac{2\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} cosnx$, then the value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ... + \infty$

    A. $\frac{\pi^2}{3}$
    B. $\frac{\pi^2}{4}$
    C. $\frac{\pi^2}{6}$
    D. $\frac{\pi^2}{12}$

    ANSWER: C

31. If $f(x) = 2x - x^2 \; in \; 0 < x < 3$, with periodicity 3, then the Fourier coefficient a_0 is equal to

    A. 1
    B. 0
    C. π
    D. 3
    ANSWER: B

32. In the Fourier sine series Expansion of $f(x) = cosx \; , \; 0 \leq x \leq \pi$ the value of b_1 is

    A. 0
    B. 1
    C. 2
    D. $\frac{1}{2}$
    ANSWER: A

33. In the Fourier sine series Expansion of $f(x) = xcosx \; , \; 0 < x < \pi$ the value of b_1 is

    A. $\frac{1}{2}$
    B. -1
    C. 1
    D. $\frac{-1}{2}$
    ANSWER: D

34. In the Fourier cosine series Expansion of $f(x) = x \; , \; 0 \leq x \leq \pi$ the value of $a_1$is

    A. $\frac{4}{\pi}$
    B. $\frac{-4}{\pi}$
    C. $\frac{2}{\pi}$
    D. $\frac{1}{\pi}$
    ANSWER: B

35. The sum of the Fourier series for $f(x) = x^2 + x \; in \; -2 < x < 2$ at x = 2 is

    A. 1
    B. 2
    C. 3
    D. 4
    ANSWER: D

36. If the Fourier series Expansion of $f(x) = x + x^2 \; , \; -\pi < x < \pi$ is $\frac{\pi^2}{3} + \sum_{n=1}^{\infty} (-1)^n (\frac{4}{n^2} cosnx - \frac{2}{n} sinnx)$, then the value of $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + ... + \infty$ is

    A. $\frac{\pi^2}{3}$
    B. $\frac{\pi^2}{4}$
    C. $\frac{\pi^2}{6}$
    D. $\frac{\pi^2}{12}$
    ANSWER: C

37. In the Fourier cosine series Expansion of $f(x) = xsinx \; , \; 0 < x < \pi$ the value of a_0 is

A. 3

B. 2

C. 1

D. 0

ANSWER: B

38. If $f(x) = 2x \; in \; 0 < x < 4$ with periodicity 4, then the value of a_2 in the Fourier series Expansion is

A. 0

B. 1

C. 2

D. 3

ANSWER: A

39. If $f(x) = (l - x)^2 \; in \; (0, 2l)$ with period $2l$, then the value of a_0 in the Fourier series Expansion is

A. $\frac{2l^2}{3}$

B. $\frac{l^2}{3}$

C. $\frac{l^2}{2}$

D. $\frac{l}{3}$

ANSWER: A

40. The value of Fourier series of f(x) in $(0, 3)$ at x = 3 is

A. f(0)

B. $f(3)$

C. $\frac{f(0)+f(3)}{2}$

D. 0

ANSWER: C