Solution mcq set 1 U4 Fourier series MTH174

unit 6 Fourier series practice problems

For the function $f(x) = x^2$, $-2 \leq x \leq 2$ the value of b_n in Fourier series expansion will be
(a)$\frac{8}{3}$ (b)0 (c)$\frac{16}{3}$ (d)noneof these Ans-b

For the function $f(x) = x^3$, $-\pi \leq x \leq \pi$ the value of a_n in Fourier series expansion will be
(a)$\frac{2}{\pi}$ (b)2π (c)0 (d)none of these Ans-c

Fourier series what is the value of Fourier coefficient for a_0 on $[-l, l]$
(a) $\frac{2}{l}\int_0^l f(x)dx$ (b) $\frac{1}{l}\int_{-l}^{l} f(x)dx$ (c) $\frac{2}{l}\int_{-l}^{l} f(x)dx$ (d) $\frac{2}{l}\int_0^l f(x)\cos\left(\frac{n\Pi x}{l}\right)dx$ Ans- b

① The value of a_0 for $f(x) = e^{-x}$ in $[-l, l]$ is

a) $\frac{e^{l} - e^{-l}}{l}$ b) $\frac{e^{l} + e^{-l}}{l}$ c) $\frac{e^{-l} - e^{l}}{l}$ d) $-\frac{(e^{l} + e^{-l})}{l}$

② For $f(x) = x \sin x$ in $[0, 2\pi]$ then a_0 is

a) 2 b) -2 c) 1 d) -1

③ Fourier Constant a_0 for $f(x) = e^{-x}$ in $0 < x < 2\pi$ is

a) $\frac{1 - e^{-\pi}}{\pi}$ b) $\frac{1 - e^{-2\pi}}{\pi}$ c) $\frac{1 + e^{-2\pi}}{\pi}$ d) $\frac{1 + e^{-\pi}}{\pi}$

④ The Value of b_1 for $f(x) = x^2$ in $(-\pi, \pi)$

a) 1 b) $1/2$ c) 0 d) 2

⑤ For $f(x) = x^2$ in $-3 < x < 3$ which is true for fourier series expansion

a) $a_0 = 0$, $a_n = 0$ b) $a_0 = 0$ c) $a_0 = 0$, $b_n = 0$ d) $b_n = 0$

⑥ Value of $\cos n\pi =$

a) $-(-1)^{n+1}$ b) $(-1)^{n}$ c) $(-1)^{-2}\,(-1)^{n+2}$ d) all of these

[Answers of above six questions- 1a, 2b, 3b,4c,5d,6d

Q46. The Fourier coefficient a_2 of the function $f(x) = \frac{x}{4}$ in the interval $(-\pi, \pi)$.

a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) 1 d) 0

Q47. The Fourier coefficient a_0 of the function $f(x) = \frac{1}{2}$ in the interval $(0, 2\pi)$.

a) 0 b) 1 c) 2 d) -1

Q48. The value of $\int_0^{2\pi} \cos nx \, dx$ is

a) 2π b) π c) 0 d) 1

[Answers: 46d, 47b, 48c]

d) -1

Q45. In the Fourier series of $f(x) = x^2$, $-2<x<2$, the Fourier coefficient b_1 is equal to

a)1 b)2 c)0 d) -1

Q46. For the Fourier series of periodic function f(x) defined in $[-\pi, \pi]$, which of the following is true:

a) $a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)dx$ b) $a_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\cos(nx)dx$ c) $b_n = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\sin(nx)dx$ d) All of these

Q47. Any even function f(x) defined in [-L,L] that is periodic with period 2L has

a)Fourier sine series b)Fourier cosine series c)Both a and b d) None of these

Q48. Find the Fourier coefficient a_n for $f(x) = 3$; $-\pi \le x \le \pi$

a) -6 b) 6 c) 3 d) 0

[Answers: 45b,46d, 47b, 48d]

1. A function $f(x), a < x < b$, can be expanded in a Fourier series
   (a) Only if it is continuous everywhere
   (b) Even if it is discontinuous at a finite number of points in (a, b)
   (c) Even if it is unbounded in (a, b)
   (d) Only if it is both continuous and bounded in (a, b)

[WBUT 2010]

2. The period of the function $f(x) = \sin 2\pi x$ is
   (a) $\frac{1}{2}$ (b) 1 (c) 0 (d) $\frac{1}{3}$

[WBUT 2009, 2008]

3. A function $f(x) = x^2, -\pi \le x \le \pi$ is represented by a Fourier series

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

   Then the value of b_n is
   (a) $\frac{2\pi^2}{3}$ (b) $\frac{4(-1)^n}{3}$ (c) 0 (d) None of these

[WBUT 2008]

4. The period of $\cos 2\pi x$ is
   (a) 2π (b) 1 (c) 2 (d) None of these

[WBUT 2007]

[WBUT 2007]

5. If $f(x) = x \sin x, -\pi \le x \le \pi$ be represented by a Fourier series

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

   Then the value of a_0 is
   (a) 2 (b) 0 (c) 4 (d) 1

[WBUT 2009, 2007]

6. The period of the function $f(x) = |\sin x|$ is
   (a) 2π (b) $\frac{\pi}{2}$ (c) 3π (d) π

[WBUT 2007]

[WBUT 2007]

5. If $f(x) = x \sin x$, $-\pi \le x \le \pi$ be represented by a Fourier series

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

Then the value of a_0 is

(a) 2 (b) 0 (c) 4 (d) 1

[WBUT 2009, 2007]

6. The period of the function $f(x) = |\sin x|$ is

(a) 2π (b) $\frac{\pi}{2}$ (c) 3π (d) π

[WBUT 2007]

11. The Fourier series of a function $f(x)$ converges to $f(x)$ if x is a point of

(a) continuity (b) discontinuity

(c) differentiability (d) None of these

12. For a function $f(x)$ having Fourier expansion

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

the expression

$$\frac{1}{\pi} \int_{-\pi}^{\pi} \{f(x)\}^2 dx = \frac{a_0^2}{2} + \sum_{n=1}^{\infty} (a_n^2 + b_n^2)$$

is called

(a) Dirichlet' identity (b) Euler's identity

(c) Parseval's identity (d) None of these

[**Ans.** 1 (b), 2 (b), 3 (a), 4 (b), 5 (a), 6 (d), 7 (c), 8 (c), 9 (b), 10 (a), 11 (a), 12 (c)]

18. The function which is an odd function in $(-\infty, \infty)$ among the following is

(a) $\cos x$ (b) $1 + x$ (c) e^{-x} (d) x **Ans:** (d)

A "periodic function" is given by a function which

(A) has a period $T = 2\pi$
(B) satisfies $f(t+T) = f(t)$
(C) satisfies $f(t+T) = -f(t)$
(D) has a period $T = \pi$

1. Which of the following is an "even" function of t?

(A) t^2
(B) $t^2 - 4t$
(C) $\sin(2t) + 3t$
(D) $t^3 + 6$