Tutorial Sheet-1

Answers

Part-A

1. State any three condition
2. $a_1 = 0$
3. $a_0 = \frac{1-e^{-2\pi}}{\pi}$.
4. $a_n = \frac{-9}{n^2\pi^2}$
5. $a_n = \begin{cases} \frac{-4}{\pi n^2}; & \text{if } n \text{ is odd} \\ 0 & \text{if } n \text{ is even} \end{cases}$

Part - B

6. $f(x) = \frac{-\pi^2}{3} + \sum_{n=1}^{\infty} \frac{-4(-1)^n}{n^2}\cos nx + \sum_{n=1}^{\infty} \frac{-2(-1)^n}{n}\sin nx$ *and* $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} ..... = \frac{\pi^2}{3}$
7. $f(x) = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}\cos nx$ *and* $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + ...\infty = \frac{\pi^4}{90}$
8. $f(x) = \frac{4\sqrt{2}}{\pi}\left\{\frac{\sin 2x}{1.3} - \frac{\sin 6x}{5.7} + \frac{\sin 10x}{9.11} - ...\right\}$
9. $f(x) = \frac{2}{\pi} - \frac{4}{\pi}\sum_{n=2}^{\infty} \frac{1}{n^2-1}\cos\left(\frac{n\pi}{2}\right)\cos nx$
10. $f(x) = \frac{2}{\pi} - \frac{4}{\pi}\sum_{n=1}^{\infty} \frac{1}{(4n^2-1)}\cos 2nx$

Tutorial Sheet-2

Answers

Part-A

1. f(x)= $\sum_{n=1}^{\infty}\left[\frac{4(-1)^n}{n^3\pi^3}+\frac{2}{n\pi}-\frac{4}{n^3\pi^3}\right]\sin n\pi x$

2. Take $x=\pi$ *and* $\sum_{n=1}^{\infty}\frac{1}{n^2}=\frac{\pi^2}{6}$

3. $b_1=1/2$

4. Take $x=0$ *and* $\sum_{n=1}^{\infty}\frac{1}{n^2}=\frac{\pi^2}{6}$

5. f(x)= $\frac{8}{\pi}\sum_{1}^{\infty}\frac{\sin x}{n^3}$

Part- B

6. f(x)= $\frac{4}{3}+\sum_{1}^{\infty}\frac{16(-1)^{n+1}}{n^2\pi^2}\cos\left(\frac{n\pi}{2}\right)x+\sum_{1}^{\infty}\frac{4(-1)^{n+1}}{n\pi}\sin\frac{n\pi}{2}x$ &*take* $x=2$,

   we get $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots=\frac{\pi^2}{4}$

7. f(x) = $\frac{1}{3}+\sum_{1}^{\infty}\frac{-4}{n^2\pi^2}\cos n\pi x$ *and take* $x=0$, *we get* $\sum_{1}^{\infty}\frac{1}{n^2}=\frac{\pi^2}{6}$

8. f(x) = $\frac{1}{3}+\sum_{n=1}^{\infty}\frac{4}{n^2\pi^2}\cos n\pi x$

9. f(x) = $1+\frac{2}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\left[1-2(-1)^n\right]\sin n\pi x$ & take x = $\frac{1}{2}$, we get $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots=\frac{\pi}{4}$

10. cosine series: f(x) = $\frac{l}{2}-\frac{4l}{\pi^2}\sum_{n=1}^{\infty}\frac{\cos\left(\frac{n\pi}{l}\right)x}{n^2}$

    sine series f(x) = $\sum_{1}^{\infty}b_n\sin\left(\frac{n\pi}{l}\right)x$ *and* $\frac{1}{1^4}+\frac{1}{3^4}+\frac{1}{5^4}+\ldots=\frac{\pi^2}{96}$.

Tutorial Sheet-3

Answers

Part -A

1. R.M.S = $\sqrt{8/15}$
2. R.M.S= π^2
3. R.M.S: The root mean square value of a function

   Y=f(x) over a given interval (a,b) is defined as $\bar{y} = \sqrt{\left\{\frac{\int_a^b y^2 dx}{b-a}\right\}}$ *and* $\bar{y} = \sqrt{1/3}$

4. f(x)= $2\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n} \sin nx.$
5. f(x) = $\frac{\pi^2}{6} + \sum_{n \text{ is even}} \frac{-4}{n^2} \cos nx$

Part-B

6. f(x) = $1.45 - 0.33\cos x - 0.1\cos 2x + 0.03\cos 3x + .. + 0.17\sin x - 0.06\sin 2x + ..$
7. f(x) = $7 + 4.565\cos\frac{\pi}{6}x - 2.833\cos\frac{2\pi}{6}x - 1.66\cos\frac{3\pi x}{6}$
8. f(x) = $4.174 + 2.450\cos x + 0.120\cos 2x + 0.08\cos 3x + 3.160\sin x + 0.034\sin 2x + 0.010\sin 3x$
9. f(x)= $0.75 + 0.37\cos\theta + 1.005\sin\theta$
10. f(x) = $-1/3 + \sum_{n=1}^{\infty}\left[\frac{4}{n^2\pi^2}(-1)^{n+1}\cos n\pi x + \frac{2}{n\pi}(-1)^{n+1}\sin n\pi x\right]$ & $R.M.S = \sqrt{8/15}$