SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF MATHEMATICS

18MAB201T/Transforms and Boundary value problems

UNIT II – FOURIER SERIES

TUTORIAL SHEET -3

PART B Questions

1.Find R.M.S value of $f(x) = x - x^2, -1 < x < 1$

2.Find R.M.S value of $f(x) = x^2, -\pi < x < \pi$.

3.Define Root Mean Square and find the RMS value of $f(x) = 1 - x, 0 < x < 1$

4.Find the half-range Fourier sine series for $f(x) = x, 0 < x < \pi$

5.Obtain the half –range cosine series for $f(x) = x(\pi - x), 0 < x < \pi$

PART C Questions

6.Compute the first two harmonic of the Fourier series of f(x) given by the following table:

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
f(x)	1	1.4	1.9	1.7	1.5	1.2	1

7.Compute first three harmonics of the half-range cosine series of y = f(x) from

x	0	1	2	3	4	5
f(x)	4	8	15	7	6	2

8. Compute the first two harmonic of the Fourier series of f(x) given by the following table:

x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
f(x)	6.824	7.976	8.026	7.204	5.676	3.674	1.764	0.552	0.262	0.904	2.492	4.736

9.The values of x and the corresponding values of f(x) over period T are given below .Show that f(x) = 0.75 + 0.37cosθ +1.004 sinθ where $\theta = \frac{2\pi x}{T}$.

x	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
f(x)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

10.Expand $f(x) = x - x^2$ as a Fourier series in $-1 < x < 1$ and using this series find the RMS value of f(x) in the interval.

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)= $-1/3 + \sum_{n=1}^{\infty}\left[\frac{4}{n^2\pi^2}(-1)^{n+1}\cos n\pi x + \frac{2}{n\pi}(-1)^{n+1}\sin n\pi x\right]$ & $R.M.S = \sqrt{8/15}$