SARDAR VALLABHBHAI PATEL INSTITUTE OF TECHNOLOGY
VASAD
B. E. Third Semester (2017-18)
Subject: Advanced Engineering Mathematics (2130002)

Tutorial: 7

Que.1 **Find the Fourier Series of following.**

(i) $f(x)=\frac{1}{4}(\pi-x)^2,\ 0<x<2\pi$

(ii) $f(x)=x^2;\ -2\le x\le 2,\quad f(x+4)=f(x)$

(iii) $f(x)=\begin{cases}\pi x & ;0\le x\le 1\\ \pi(2-x) & ;1\le x\le 2\end{cases}$

(iv) $f(x)=\begin{cases}-\pi & ;-\pi\le x\le 0\\ x & ;0\le x\le \pi\end{cases}$

and show that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.......$

(v) $f(x)=x-x^2,\ -\pi<x<\pi$

And hence deduce that $\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+.......$

Que.2 Find the Fourier cosine series of the periodic function $f(x)=x,\ 0<x<L,\quad p=2L.$ Also sketch f(x) and find its periodic extension.

Que. 3 Find half range cosine series for $f(x)=\sin x\ in\ (0,\pi)$ and show that $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+.....=\frac{\pi}{4}$.

Using parseval's identity, prove that $\frac{1}{1^2\cdot 3^2}+\frac{1}{3^2\cdot 5^2}+\frac{1}{5^2\cdot 7^2}+.....=\frac{\pi^2-8}{16}$.

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

Que.5 Find the half range Fourier sine series of $f(x),\ where\quad f(x)=\begin{cases}2x & ,0<x<1\\ 4-2x & ,1<x<2\end{cases}$

Que.6 Find the Fourier integral representation of the function $f(x)=\begin{cases}2 & ,|x|<2\\ 0 & ,|x|>2\end{cases}$

Que.7 Find the Fourier sine and cosine integral of $f(x)=e^{-kx},\ where\ \ x>0,\ k>0$

Que.8 Show that (i) $\int_0^\infty \frac{\cos\omega x+\omega\sin\omega x}{1+\omega^2}d\omega=\begin{cases}0 & if\quad x<0\\ \pi/2 & if\quad x=0\\ \pi e^{-x} & if\quad x>0\end{cases}$

(ii) $\int_0^\infty \frac{1-\cos\pi\omega}{\omega}\sin\omega x d\omega=\begin{cases}\frac{\pi}{2} & ,0<x<\pi\\ 0 & ,x>\pi\end{cases}$