EXPERIMENT – 2

Aim: Determination of various parameters of a signal.

Objectives:-

- Periodicity of a signal
- Even and odd components of a signal.
- Energy and power associated with the signal

Software: MATLAB

Pre-Lab

Periodic and Aperiodic signal:

An analog signal $x(t)$ is periodic if it is defined for all possible value of $-\infty < t < \infty$ and there is a positive real value T_0, the period of $x(t)$ such that $x(t + kT_0) = x(t)$ for any integerk.

Even and odd component of the signal

Even and odd signals are defined as follows: $x(t)$ even: $x(-t) = x(t)$ and $x(t)$ odd: $x(-t) = -x(t)$ any signal $x(t)$ is representable as a sum of even and odd component. $x(t) = x_e(t) + x_o(t)$ Where the even component and the odd components are: $x_e(t) = \frac{x(t)+x(-t)}{2}$, $x_o(t) = \frac{x(t)-x(-t)}{2}$.

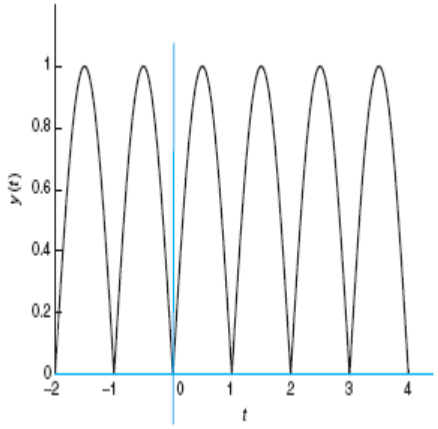
Energy and Power associated with signal

The energy and the power of an analog signal $x(t)$ are defined for either finite or infinite support signals as: Energy $E_x = \int_{-\infty}^{\infty} |x(t)|^2 \, dt$, and Power $P_x = \lim_{T\to\infty} \frac{1}{2T} \int_{-T}^{T} |x(t)|^2 \, dt$ the signal $x(t)$ is then said to be finite Energy or square integrable whenever $E_x < \infty$ and the signal is said to have finite power if $P_x < \infty$.

In-Lab: (Write MATLAB programs to do the following)

1. Consider the analog signal $x(t) = Acos(\Omega_0 t + \theta)$ for $-\infty < t < \infty$. Determine the period of the signal, if $\Omega_0 = 2\pi, 3\pi, 4\pi, 5\pi, 10\pi$ and plot the same.
2. Consider the signal $x(t) = \cos(2\pi t) + \cos(4\pi t)$ and $y(t) = \cos(2\pi t) + \cos(2t)$ for $-\infty < t < \infty$. Determine if these signals are periodic, and if so find their periods.
3. Find the power of the signal $x(t) = \cos\left(\frac{\pi t}{2} + \frac{\pi}{4}\right)$

4. Find the energy of the signal $x(t) = e^{-2t}, t \geq 0$
5. Find the even and odd components of the signal given in Q. no. 4 and plot the same.
6. **calculation of power in a full wave rectified signal**
   Consider the full-wave rectified signal $y(t) = |\sin(\pi t)|, -\infty \leq t \leq \infty$ .Part of which is shown in fig. below. Calculate the power of the signal $y(t)$.



Program:-
Results and Discussion:
Post-Lab

1. Check the signal $x(t) = 4\cos(\pi t) - \sin(3\pi t + \frac{\pi}{2})$ is periodic or not.
2. Find the even and odd components of the signal: $x(t) = e^{-t}\cos(2\pi t)\, u(t), 0 \leq t \leq 5$