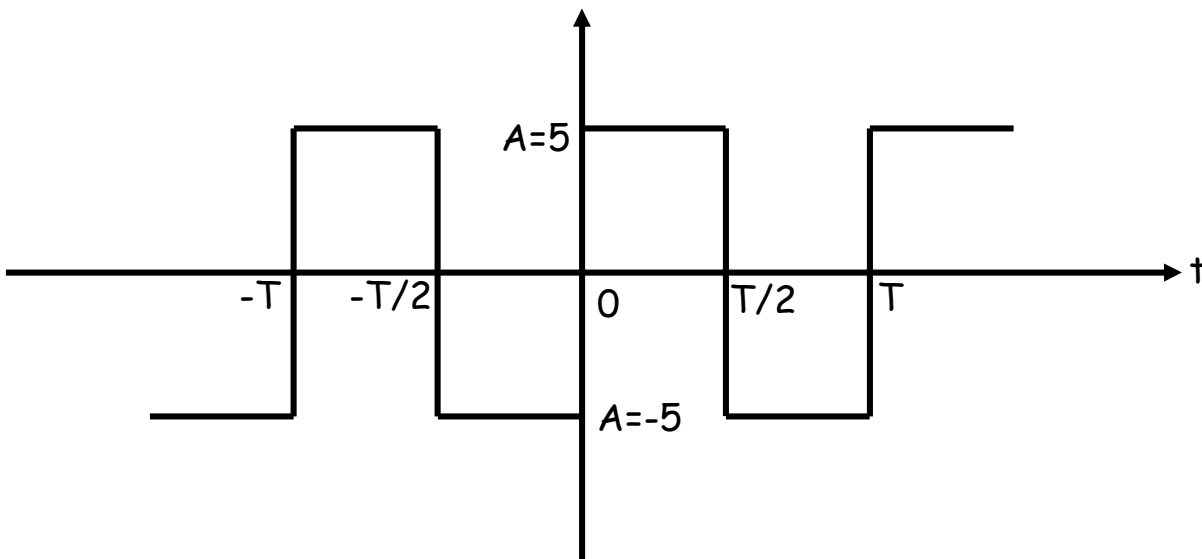**Lab#5 – Fourier Series Using MATLAB**

LAB ASSIGNMENT 1

Find the Fourier Series representation for the following signal and plot the signal using your Fourier Series representation for number of harmonics, $n = 1, 15, 50, 200$ and also plot 1st 10 harmonics amplitude

Before starting this assignment, please read the note that I have given for "Fourier Series". For your help, let's Do it Step by Step:

1. Is it a Periodic Function?   Yes/No

2. What kind Symmetry does this signal has?
   a) Odd Symmetry   b) Even Symmetry   c) Half – wave Symmetry
3. Based on its symmetry what kind of coefficients it will have?

   a) a_0 b) $a_n (odd / even / both)$ b) $b_n (odd / even / both)$

4. Write the Function $f(t)$ for this signal.
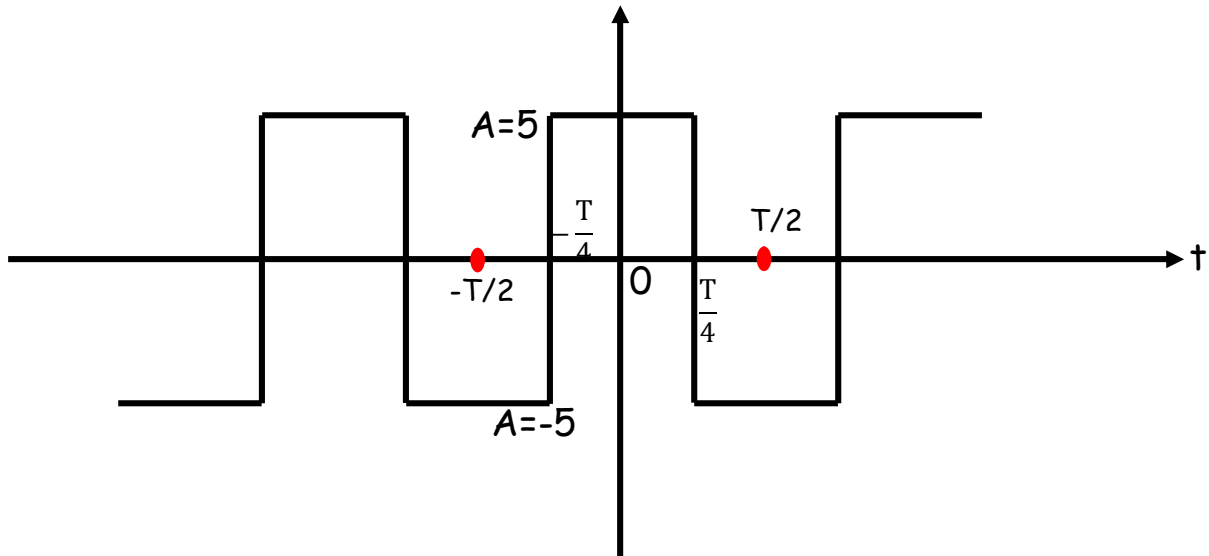
5. Calculate the coefficients

6. Final Fourier Series representation of the signal

7. Now plot the signal using the Fourier series representation that you derived for different number of harmonics, $n = 1,15,50,200$ and 1st 10 harmonics amplitude

LAB ASSIGNMENT 2

Find the Fourier Series representation for the following signal and plot the signal using your Fourier Series representation for number of harmonics, $n = 1, 15, 50, 200$ and also plot 1st 10 harmonics amplitude

Let's Do it Step by Step:

1. Is it a Periodic Function?   Yes/No

2. What kind Symmetry does this signal has?

   a) Odd Symmetry   b) Even Symmetry c) Half – wave Symmetry

3. Based on its symmetry what kind of coefficients it will have?

   a) a_0 b) $a_n (odd \, / \, even \, / \, both)$ b) $b_n (odd \, / \, even \, / \, both)$

4. Write the Function $f(t)$ for this signal.

5. Calculate the coefficients

6. Final Fourier Series representation of the signal

7. Now plot the signal using the Fourier series representation that you derived for different number of harmonics, $n = 1,15,50,200$ and 1st 10 harmonics amplitude

Questions:

1. Why do we need Fourier series representation?

2. What is Gibbs Phenomenon and why it occurs?

3. Represent the Fourier Series expansion in exponential Fourier series for both assignments.

4. Compute the RMS value of both signals from the general equation that we know and from your Fourier series representation and compare those.

5. What is line spectrum?

6. Do you think is it possible to calculate average power using Fourier series of a circuit if I represent both voltage and current of that circuit in Fourier series?