Laboratory work #3 Sampling a Signal in Matlab

**Goal of the lab**: Learn how sampling rate influences on discrete signal (proper and improper sampling)

**Introduction:** By Nyquist Shannon sampling theorem, for faithful reproduction of a continuous signal in discrete domain, one has to sample the signal at a rate 𝑓𝑠 higher than at-least twice the maximum frequency 𝑓𝑚 contained in the signal.

Matlab or any other simulation softwares process everything in digital i.e, discrete in time. Therefore, we cannot generate a real continuous-time signal on it, rather we can generate a “continuous-like” signal by using a very very high sampling rate. When plotted, such signals look like a continuous signal.

**Task:** Generate a continuous signal and sample it at a given rate. In simulations, generate a continuous time signal and convert it to discrete domain by appropriate sampling.

1. Generate a simple continuous-like sinusoidal signal with frequency 𝑓𝑚. In order to make it appear as a continuous signal when plotting, use a sampling rate of 𝑓𝑠 bigger. Generate eight cycles of sinusoid.
2. Convert the signal to discrete-time equivalent by sampling. Sample the signal at 𝑓𝑠1 and then at 𝑓𝑠2 (show an aliasing result) for illustration. Use one window for all graphs.

Use following operators of Matlab while programing:

subplot plot

xlabel

ylabel hold on; stem