



# **AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

## **Department of Electrical and Electronic Engineering**

### **Project**

Course Name: Digital Signal Processing Lab

### **Submitted by**

Name: Mohsin Islam Rifat

ID: 190105046

Year: 3<sup>rd</sup>

Semester: 2<sup>nd</sup>

Section: A-2

## Task-1

Program to implement a sampling rate conversion.

(i)

Let,

Up-sampling factor = 3

Down-sampling factor = 2

Input frequency,  $f_1 = 100$  Hz &  
 $f_2 = 200$  Hz

(ii)

$$\begin{aligned}x[n] &= \sin(2\pi f_1 n) + \sin(2\pi f_2 n) \\&= \sin(2\pi \cdot 100 \cdot n) + \sin(2\pi \cdot 200 \cdot n) \\x &= \sin(2\pi \cdot 100) + \sin(2\pi \cdot 200) \quad [\text{let } n = 1]\end{aligned}$$

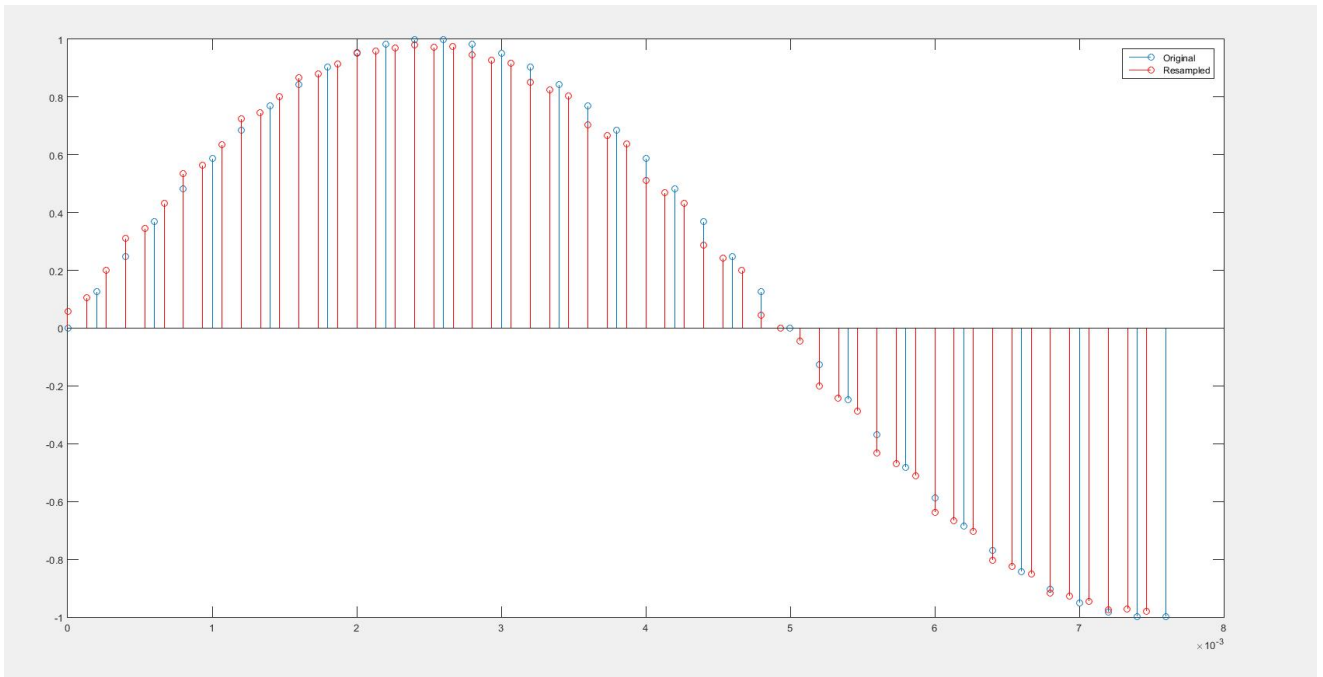
### (iii) Code:

```
clc;
clear all;
close all;

hsin = dsp.SineWave(1,[100 200],'SampleRate',
5000,'SamplesPerFrame', 50);
% Create a FIR rate converter filter.
% The default interpolation factor is 3 and
decimation factor is 2.
hfirrc = dsp.FIRRateConverter;
input = step(hsin);
output = step(hfirrc, input);

% Plot the original and resampled signals.
ndelay=round(length(hfirrc.Numerator)/2/hfirrc.D
ecimationFactor);
indx = ndelay+1:length(output);
x = (0:length(indx)-
1)/hsin.SampleRate*hfirrc.DecimationFactor/hfirrc
.InterpolationFactor;
stem((0:38)/hsin.SampleRate, input(1:39));
hold on;
stem(x,
hfirrc.InterpolationFactor*output(indx),'r');
legend('Original','Resampled');
```

## (iv) Output:



MATLAB R2015a

HOME PLOTS APPS EDITOR PUBLISH VIEW

Find Files Find Compare Go To Comment Breakpoints Run Run and Advance Run and Time

FILE NAVIGATE EDIT BREAKPOINTS RUN

Current Folder: D:\F32 DSP Lab\Final\_Assignment\Demo.m

Name Value

Name	Value
hfilter	1x1 FIRRateC
hsin	1x1 SineWave
indx	1x57 double
input	50x2 double
ndelay	18
output	75x2 double
x	1x57 double

```
1 clc;
2 clear all;
3 close all;
4
5 hsin = dsp.SineWave(1,[100 200],'SampleRate', 5000,'SamplesPerFrame', 50);
6 % Create a FIR rate converter filter.
7 % The default interpolation factor is 3 and decimation factor is 2.
8 hfilter = dsp.FIRRateConverter;
9 input = step(hsin);
10 output = step(hfilter, input);
11
12 % Plot the original and resampled signals.
13 ndelay = round(length(hfilter.Numerator)/2/hfilter.DecimationFactor);
14 indx = ndelay+1:length(output);
15 x = (0:length(indx)-1)/hsin.SampleRate*hfilter.DecimationFactor/hfilter.InterpolationFactor;
16 stem((0:38)/hsin.SampleRate, input(1:39));
17 hold on;
18 stem(x, hfilter.InterpolationFactor*output(indx), 'r');
19 legend('Original', 'Resampled');
```

Command Window

New to MATLAB? See resources for [Getting Started](#).

>>

