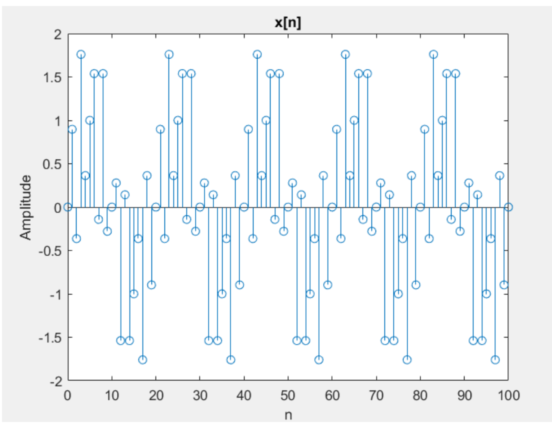
Betül Dinçer

64750

28/05/2021

REPORT 6

Part A:



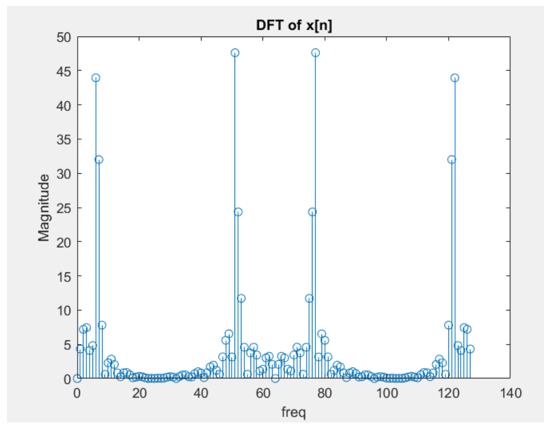
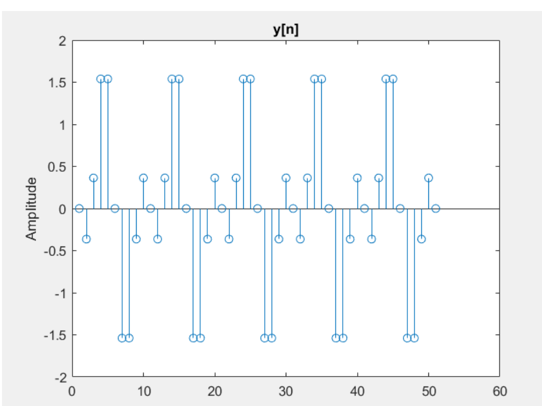


Figure 1.

Figure 2.

PART B:



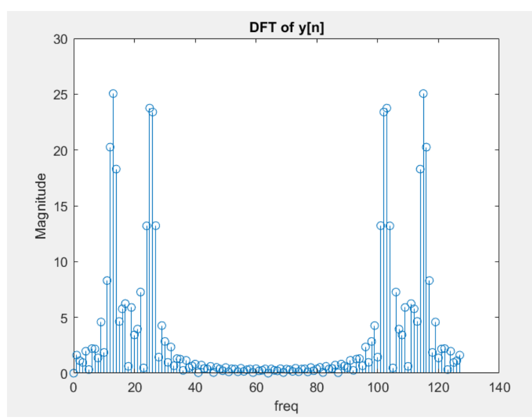
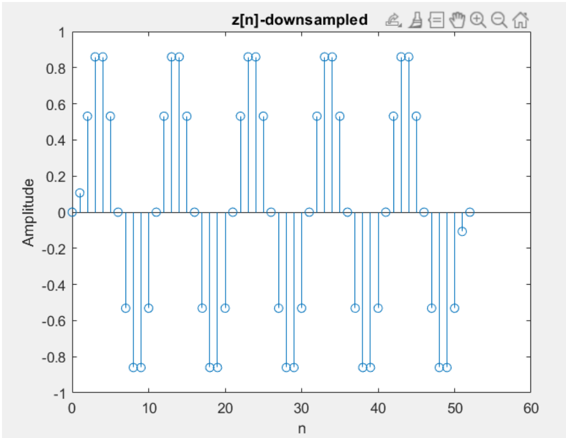


Figure 3.

Figure 4.

Part c:



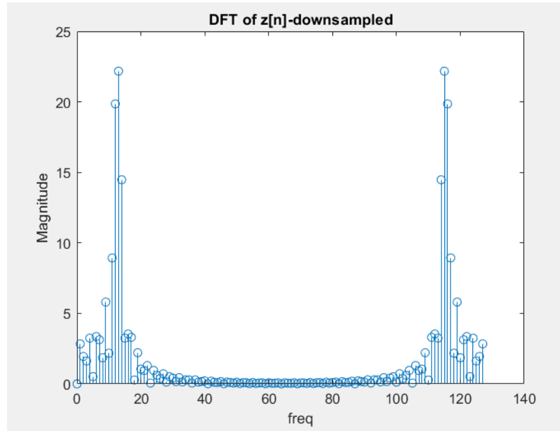
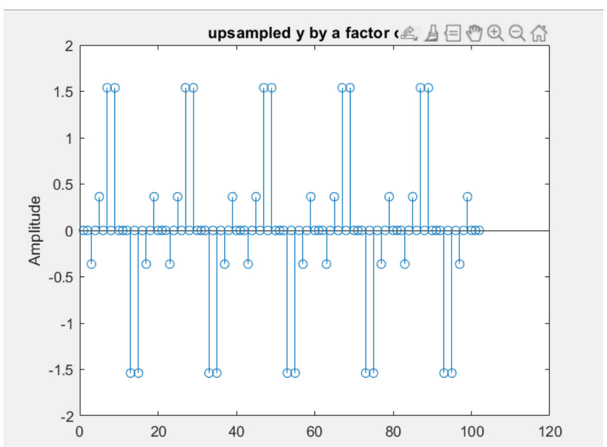


Figure 5.

Figure 6.

For the C part, we first applied linear convolution to y function then we downsampled by a factor of two. If we compare the Figure 3 and Figure 5, we can see the amplitude change due to amplitu2de of convoled signal which is 0.2. Also, we can say that because the downsampling removes the samples, the resulting signals have length 51. When we take the DFT, convolution with h lead to multiplication with H in frequency domain. Since h is rectangular signal in time domain, the sinc function multiplied with x which decreased the magnitude of the samples between 20 to 40 and 90 to 110.

PART D:



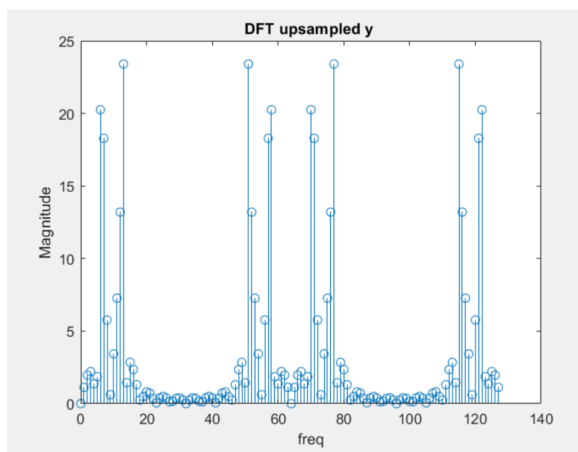
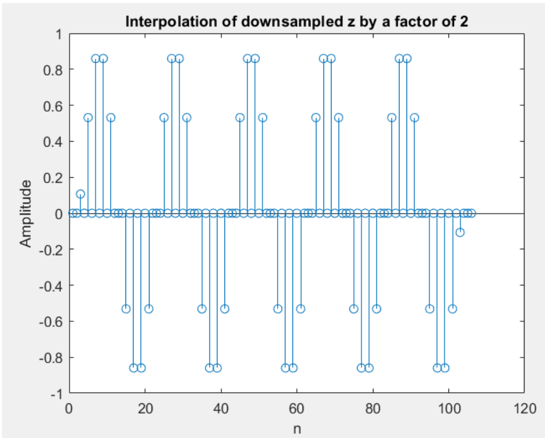


Figure 7.

Figure 8.



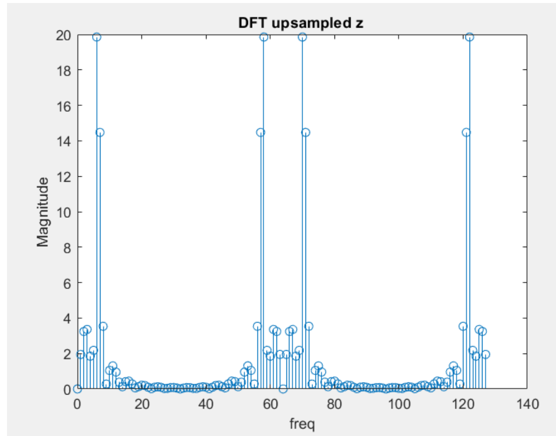
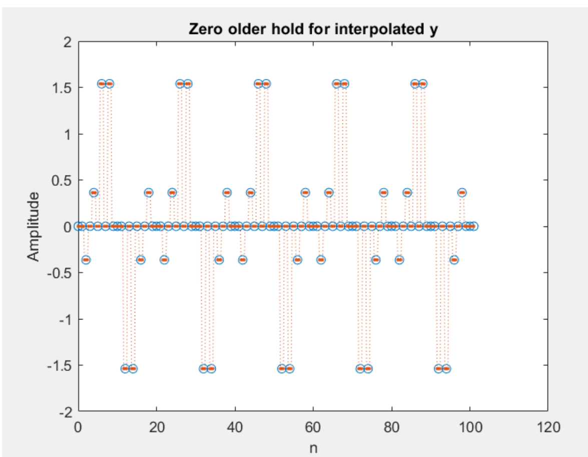


Figure 9.

Figure 10.

PART E:



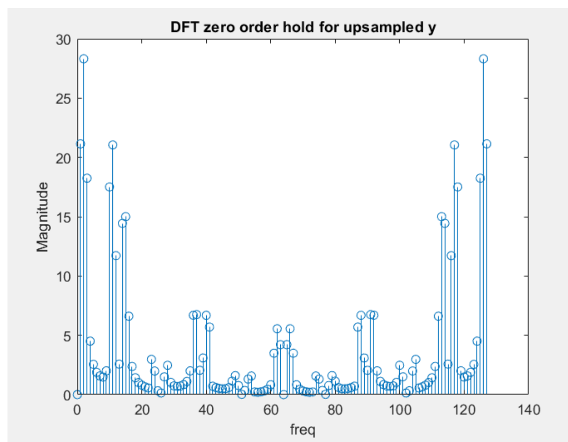
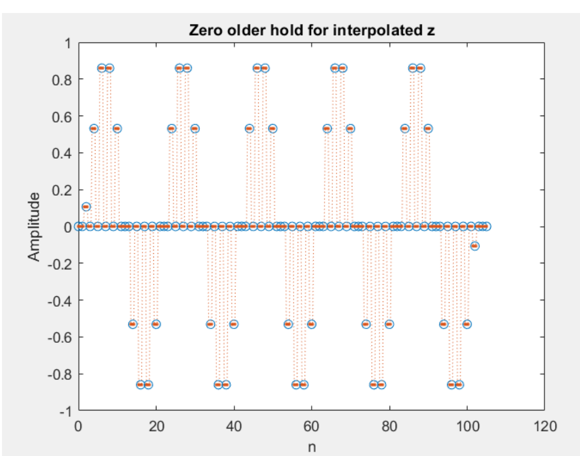


Figure 11.

Figure 12.



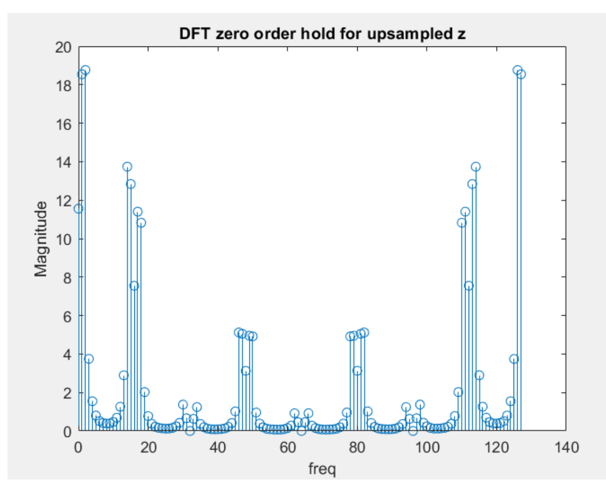
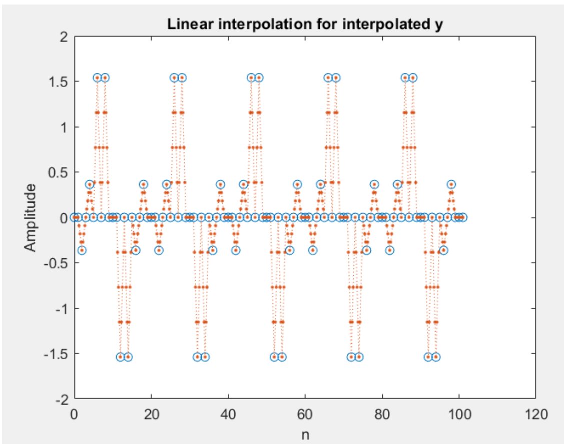


Figure 13. **Figure 14.**

PART F:



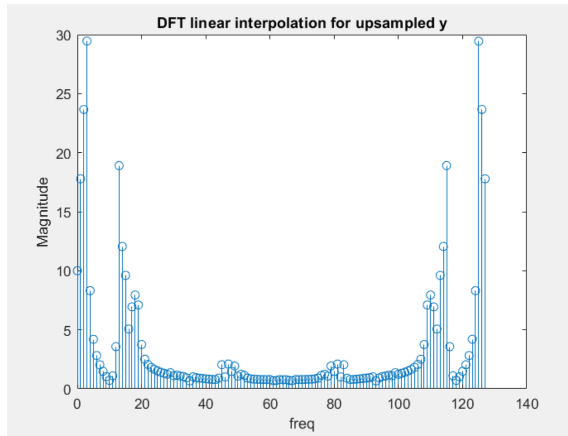
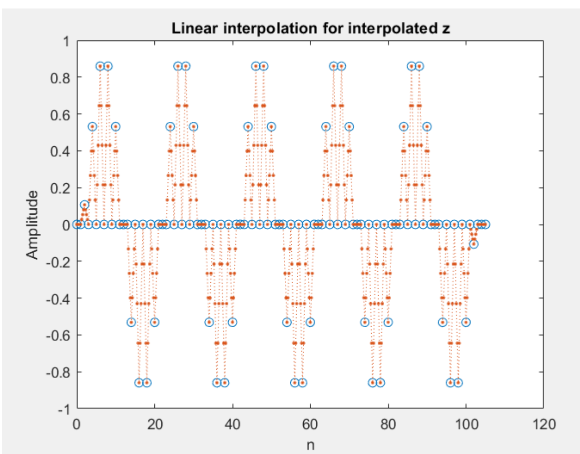


Figure 15. **Figure 16.**



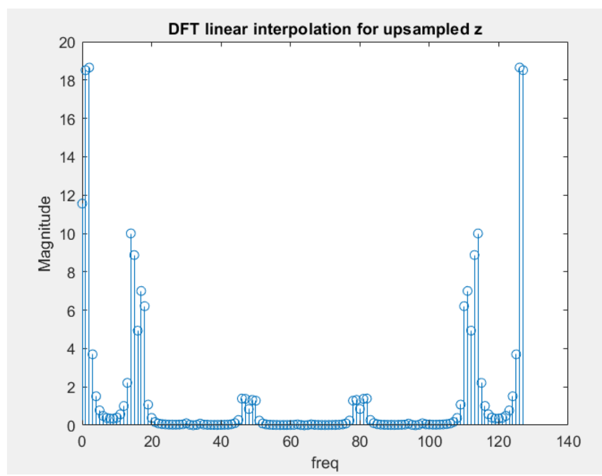


Figure 17. **Figure 18.**

PART G:

In the A part, we had addition of two different sin signals and their 128 points DFT's. In the D part, we upsampled both y and z signals by a factor of 2. In the B part, we found y as a downsampled signal of x by a factor of 2, so we eliminated one of two samples of x in the B part and in the D part we add zeros to one of two samples. If we look at DFT of signals, since the downsampling by a factor of 2 leads to ½ factor in front of the frequency domain signal and the interpolation does not affect the magnitude, the magnitude of DFT domain samples dropped to the one half. In the E part, we applied the zero order hold to interpolated y and z signals which is a method for sample replication. Since we created y and z as a result of downsampling x, we can build a connection between original signal x and the zero order hold interpolated signals. We know that zero order hold interpolation holds the sample until other sample starts. If we look at the E part, we can clearly saw this effect of zero order interpolation on the y and z signals. For the frequency domain, the zero order hold interpolation introduced additional peak samples for both y and z and it changed the magnitude of those signals because the zero-order hold filter is far from the ideal low-pass filter. For the F part, we implemented linear interpolation which creates samples that are both non-zero and not holded instead this method adds increasing or decreasing order samples in other words samples of triangle function. When we looked at figures in the part F, we can clearly see this effect on both y and z signals in time domain. For DFT representation, we see that signals have lower number of peaks since it has lower sidelobes than zero-order hold, yet, it is still deviates from the ideal low-pass filter. Also we know that there is 1/L multiplication factor in front of the sinc function hence the magnitude is also dropped.