DSP Lab Solutions Report

الاسم: حمدي عبدالرحمن الشرقاوي

السكشن: 2

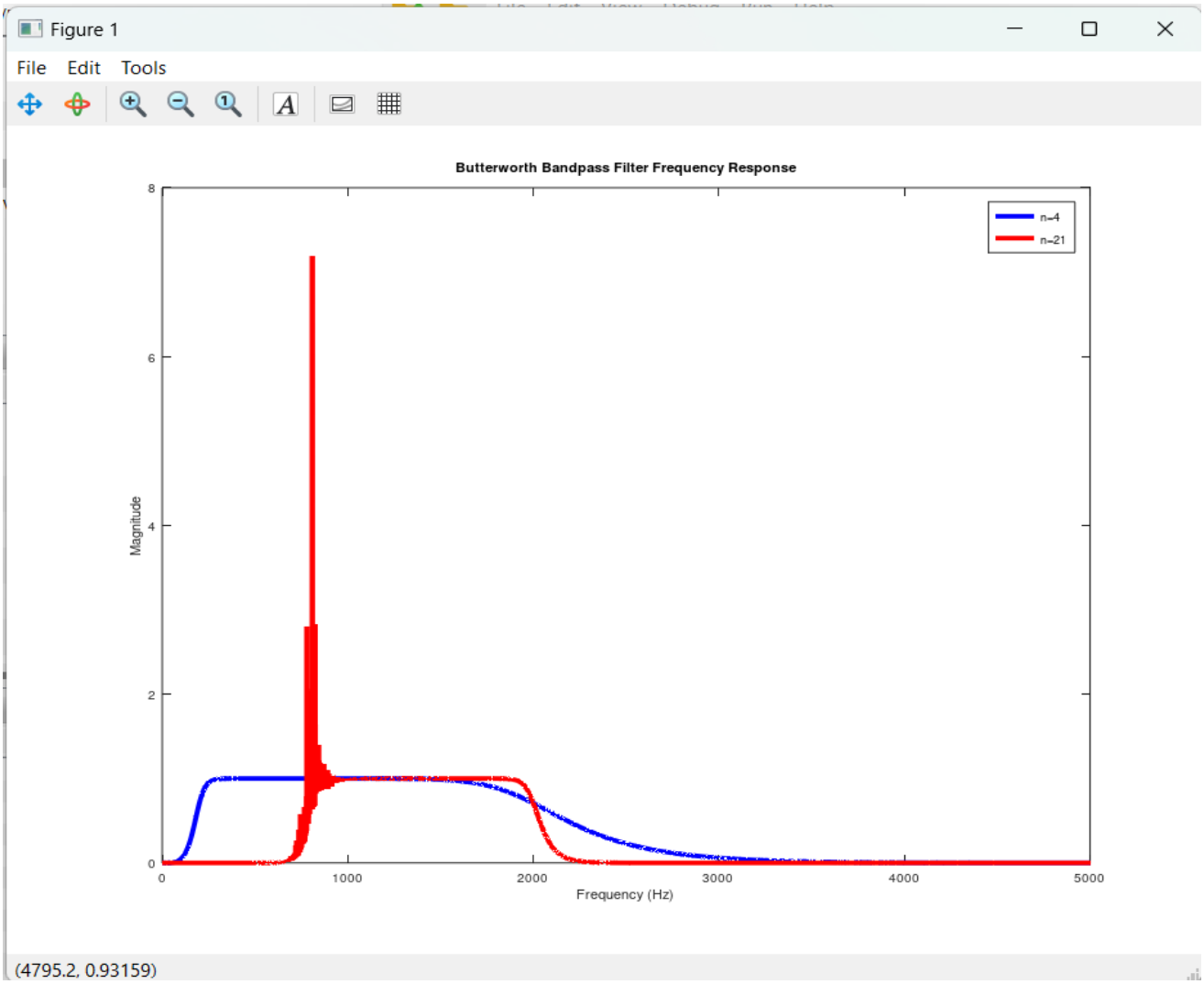
الكود: 20812019100770

رقم الجلوس: 5279

Problem 1:

Freq. response output figures:

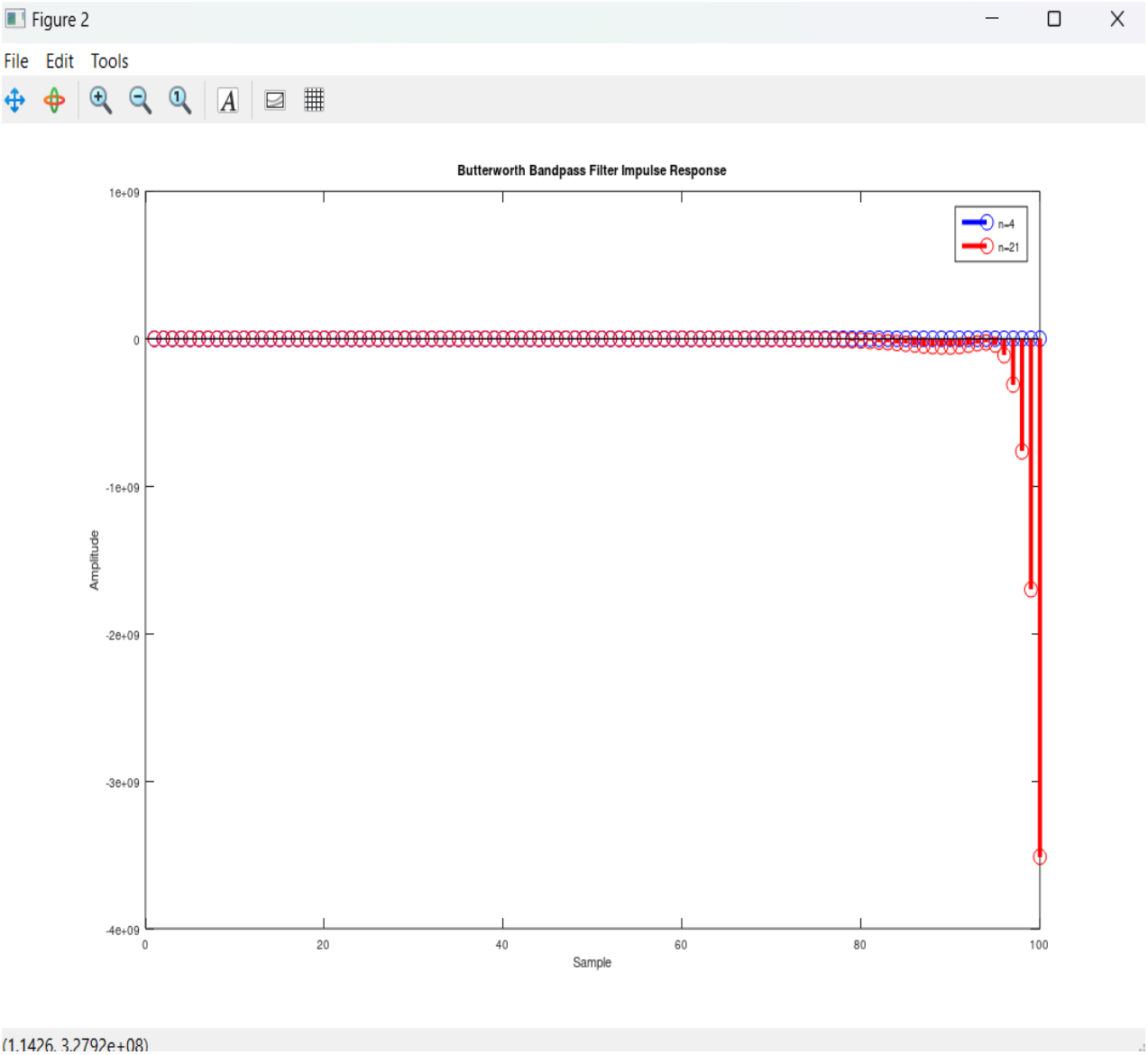
“Blue line for filter order = 4 and the red for order = 21”



Note the finite duration.

Impulse response output figures:

“Blue line for filter order = 4 and the red for order = 21”

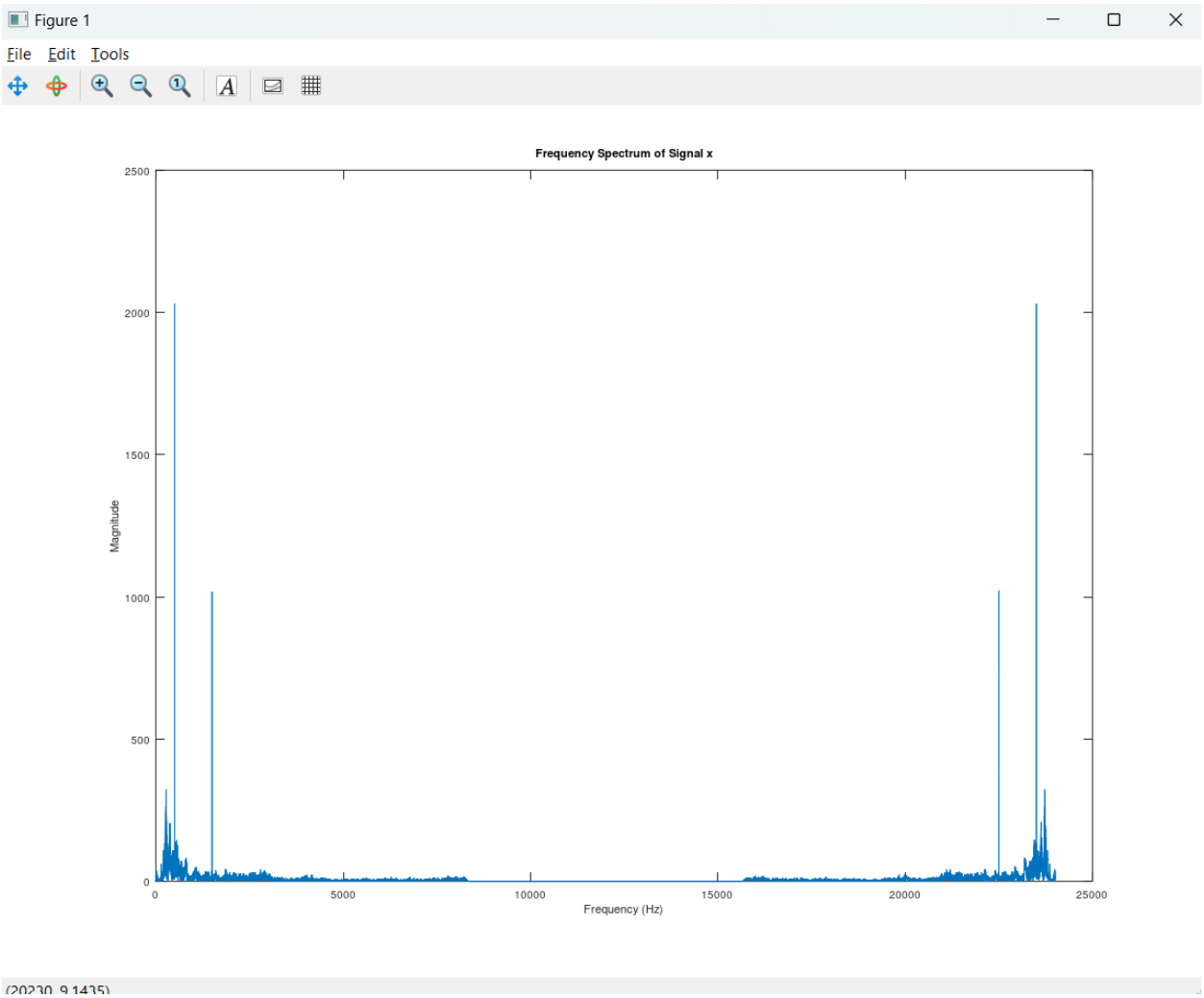


As the impulse response decays to zero and both plots have Finite duration, *the system is* ***Stable***.

Problem 2:

The filter designed to remove noise noticed as the peaks is ***Stable.***

Frequency spectrum for the original signal is:

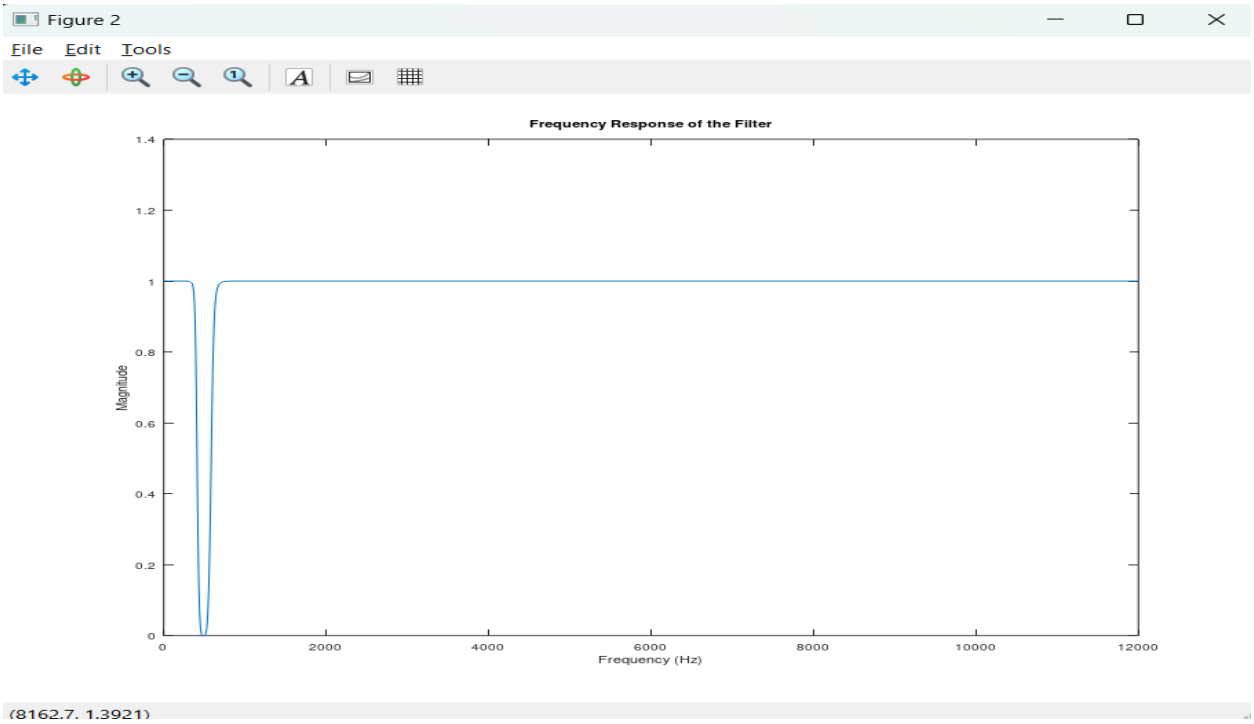


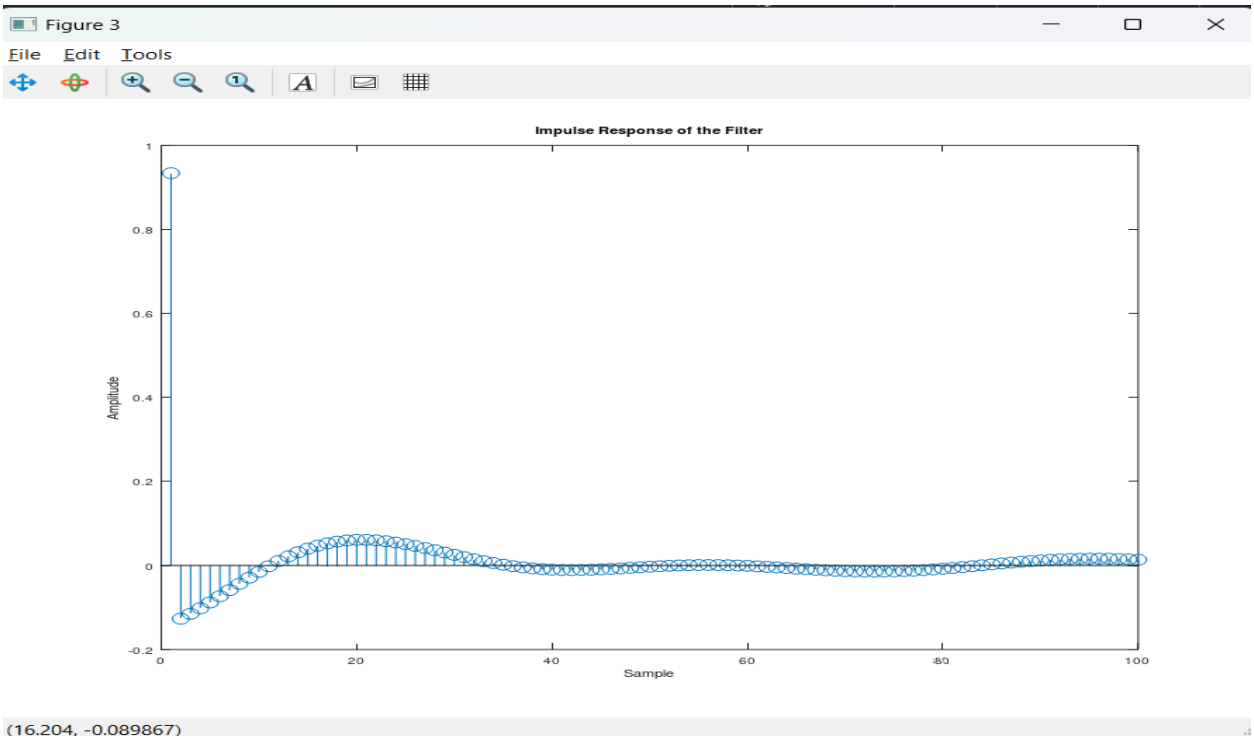
we need to remove these two peaks

([400;600] & [1400;1600]).

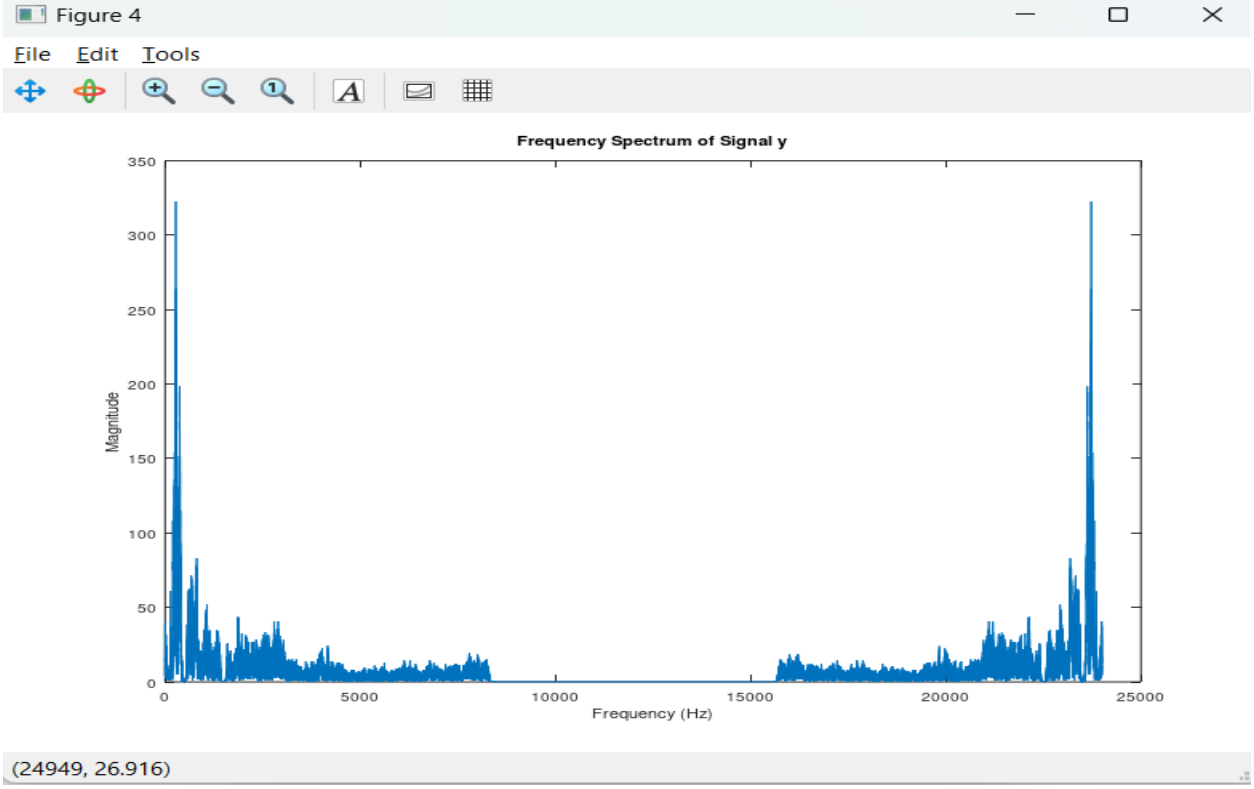
Filter figures 2,3:

The filter is ***stable*** as impulse decays to zero.





Frequency response of the output signal y is:



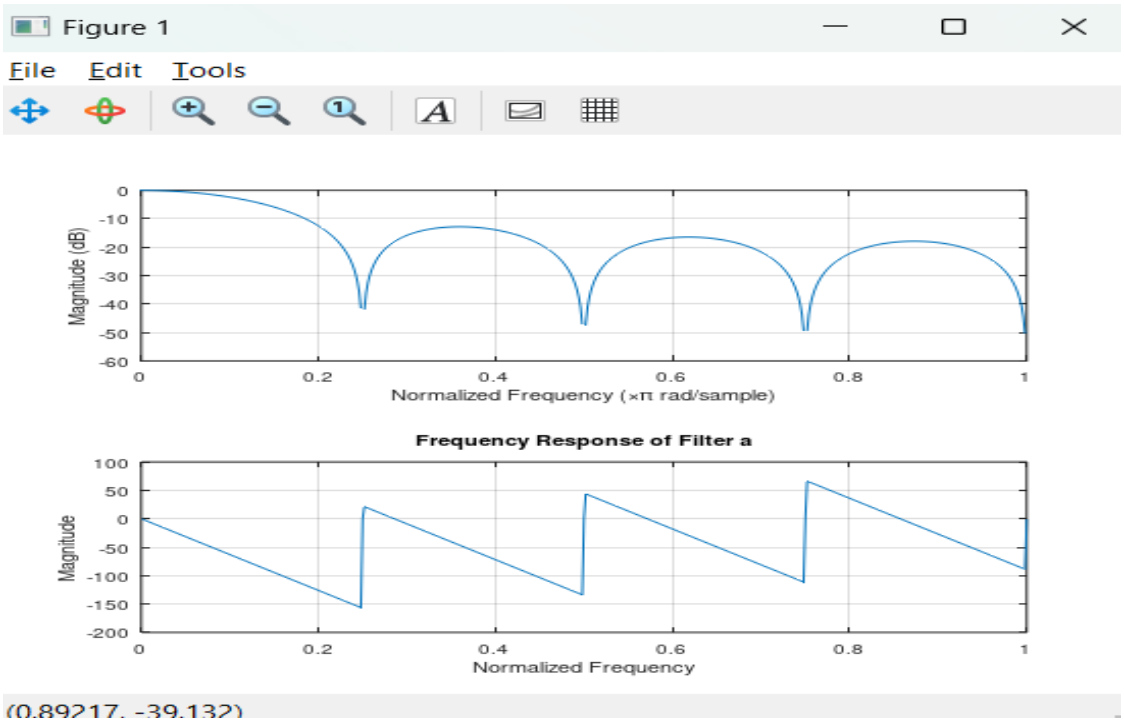
Energy is the sum of square values of the signal:

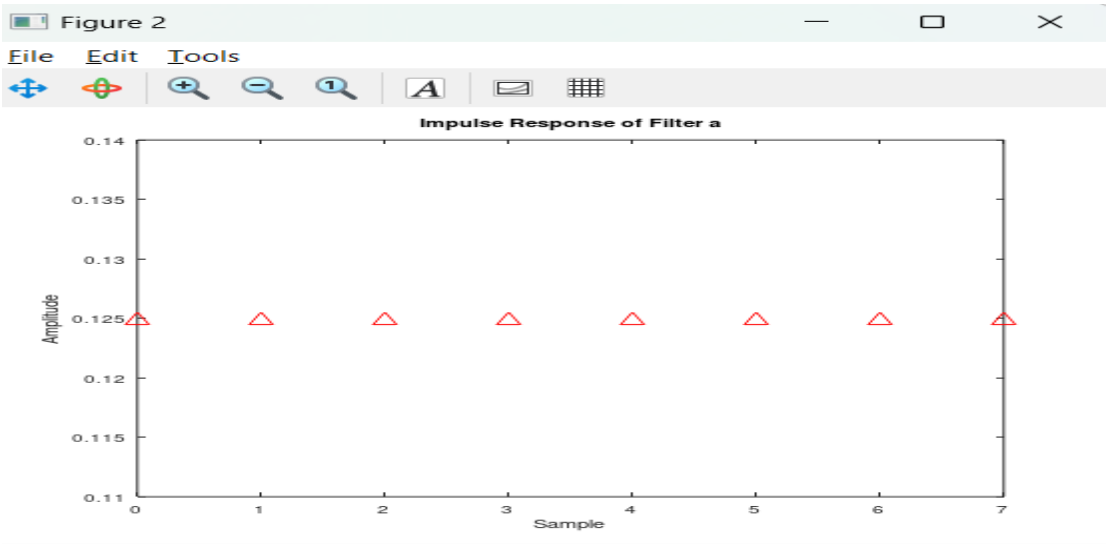
Energy of original signal = 585.821949

Energy of filtered signal = 252.517677

Problem 3:

The first filter gives the average of the current signal samples and the previous seven samples, and from the frequency and impulse responses in the following figures we may notice that it has a low-pass characteristic, and finite samples length with high attenuation of high frequency components.





Second filter figures:

The second filter is a first-order IIR filter that averages last output with the subtraction of current sample and previous sample number eight before current one that attenuates frequencies around PI and it has an infinite length, with a decaying oscillatory behavior.