Lab report-2

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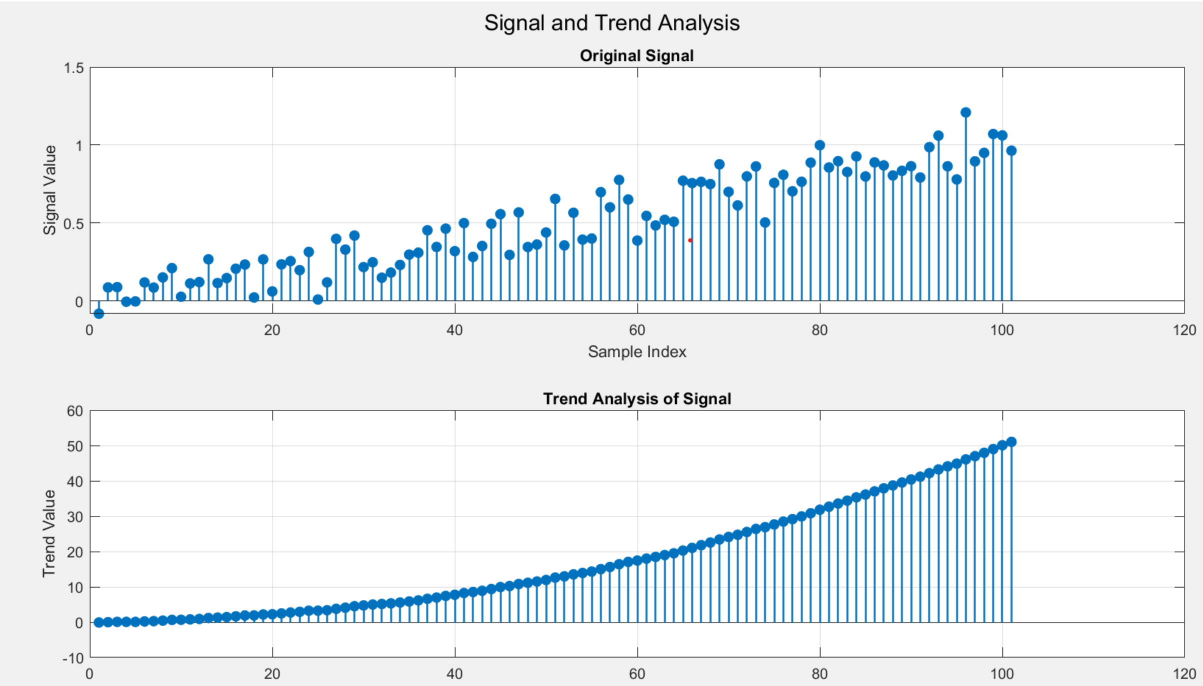
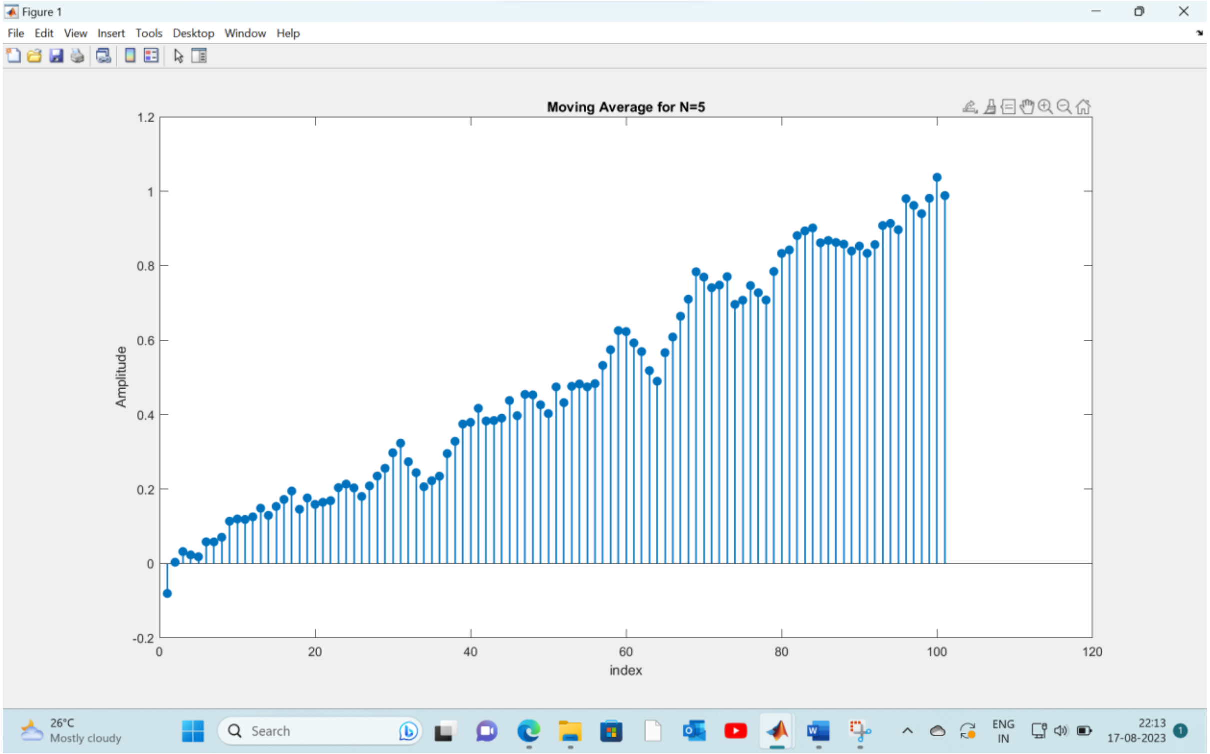
Roll No:2022102021

1.c)The trend of the given test sequence s[n],for the signal provided in q1.mat file is

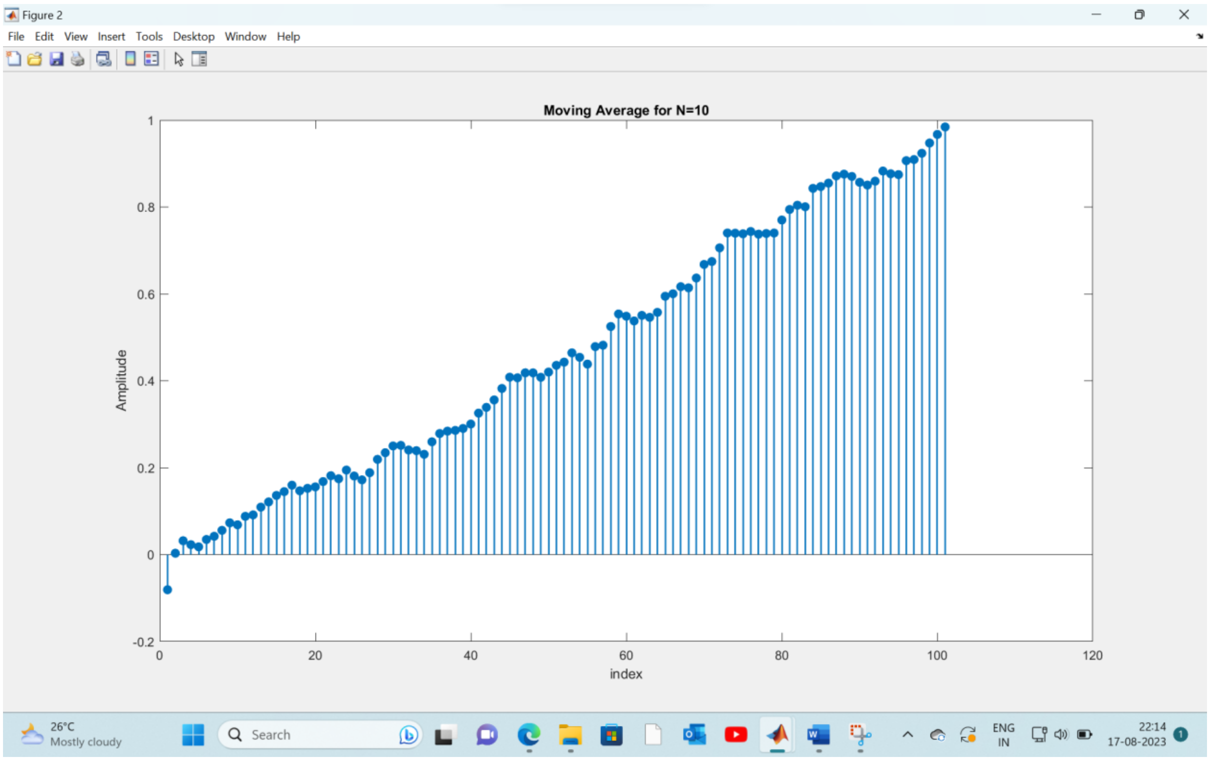


1.d)

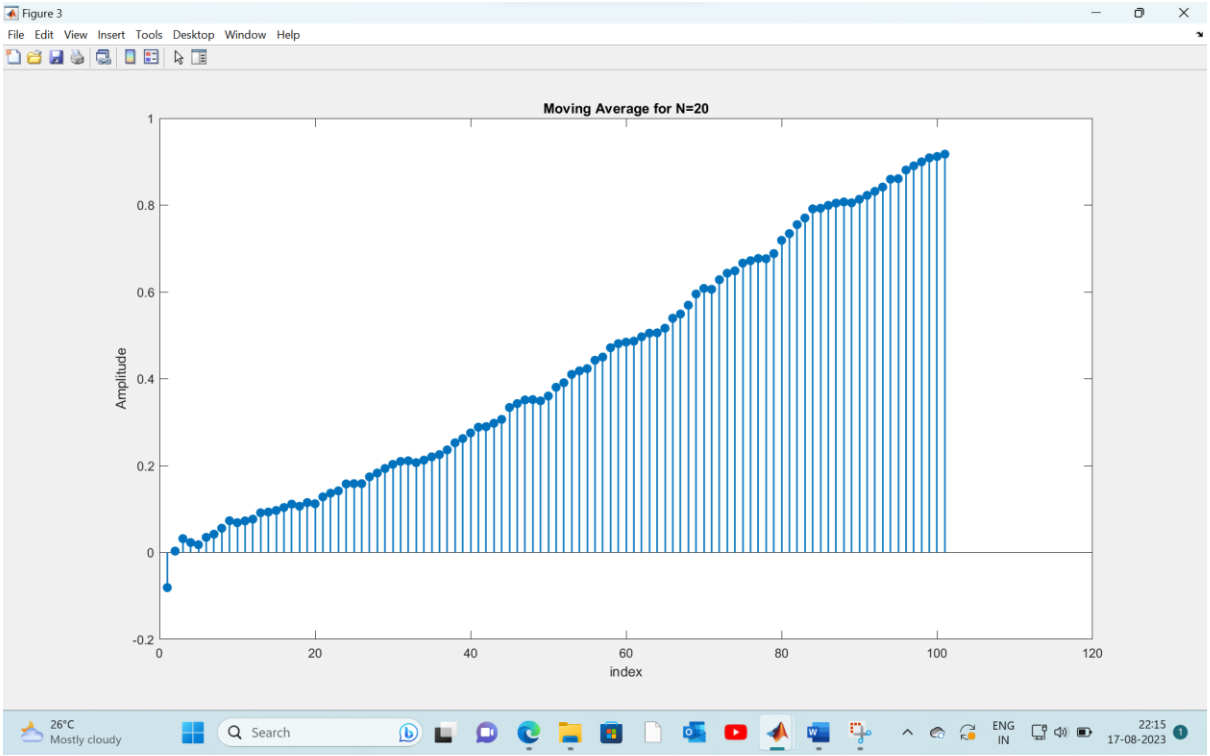
For N=5



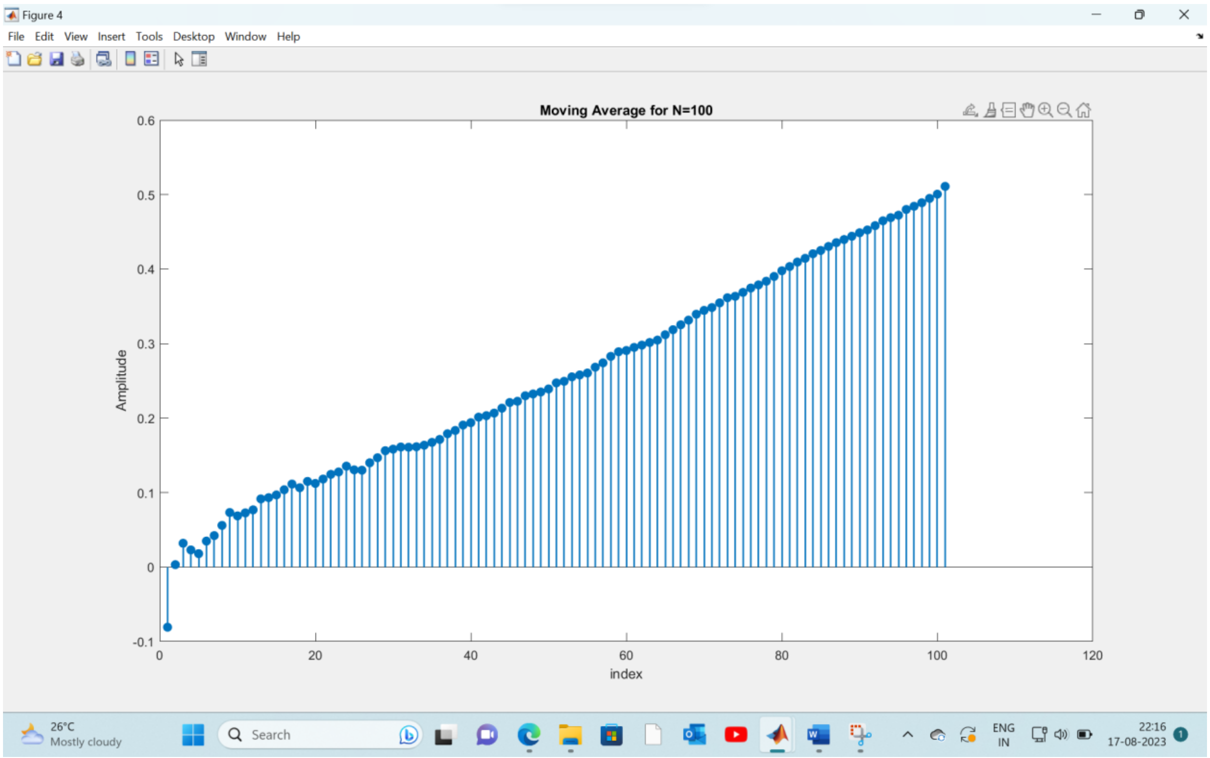
For N=10



For N=20



For N=100



Here the moving average filter calculates the average of the signal values within a window of size ‘N’ centred at each sample .

When we change the N values , it affects the behaviour of the moving average filter .

When N is small:

The moving average window covers fewer samples in the signal.

The plot will have more fluctuations and may follow the signal more closely.

The plot will be more responsive to rapid changes in the signal , capturing short-term variations and noise.

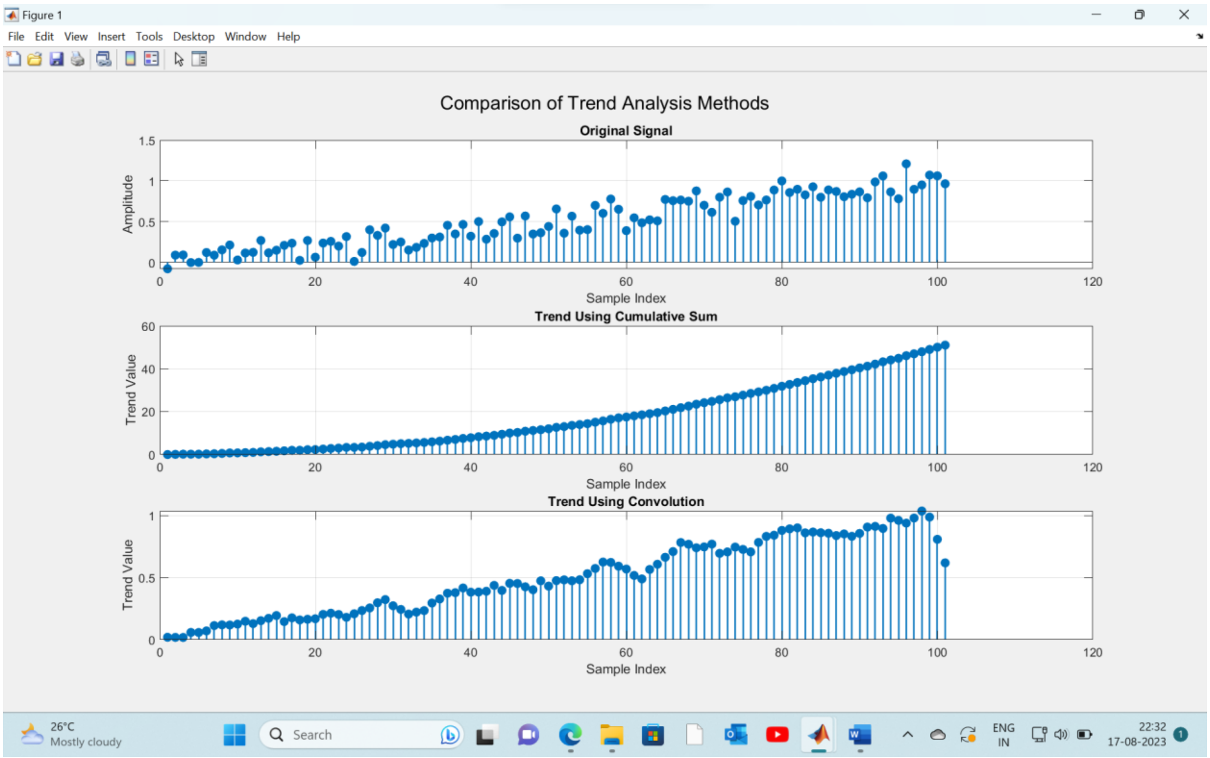
When N is large:

When N is large , the moving average window covers more samples in the signal.

The plot will provide a clearer view of the overall trend in the signal ,filtering out short-term variations and noise.

In the plot there will be smoother and less responsive to rapid changes in the signal.

1.1)



Comparison:

The two implementations , using cumulative sum and using convolution with the impulse response , will produce similar trend plots for the signal.

For the Cumulative Sum:

Pros:

*simple and straightforward to implement.

*Does not require additional convolutions operations.

Cons:

*Sensitive to noise and outliers ,as it accumulates all values.

*May show more fluctuations due to cumulative nature.

Convolution with Impulse Response:

Pros:

*provides a smoother trend by averaging neighbouring values.

*can effectively suppress noise and short-term fluctuations.

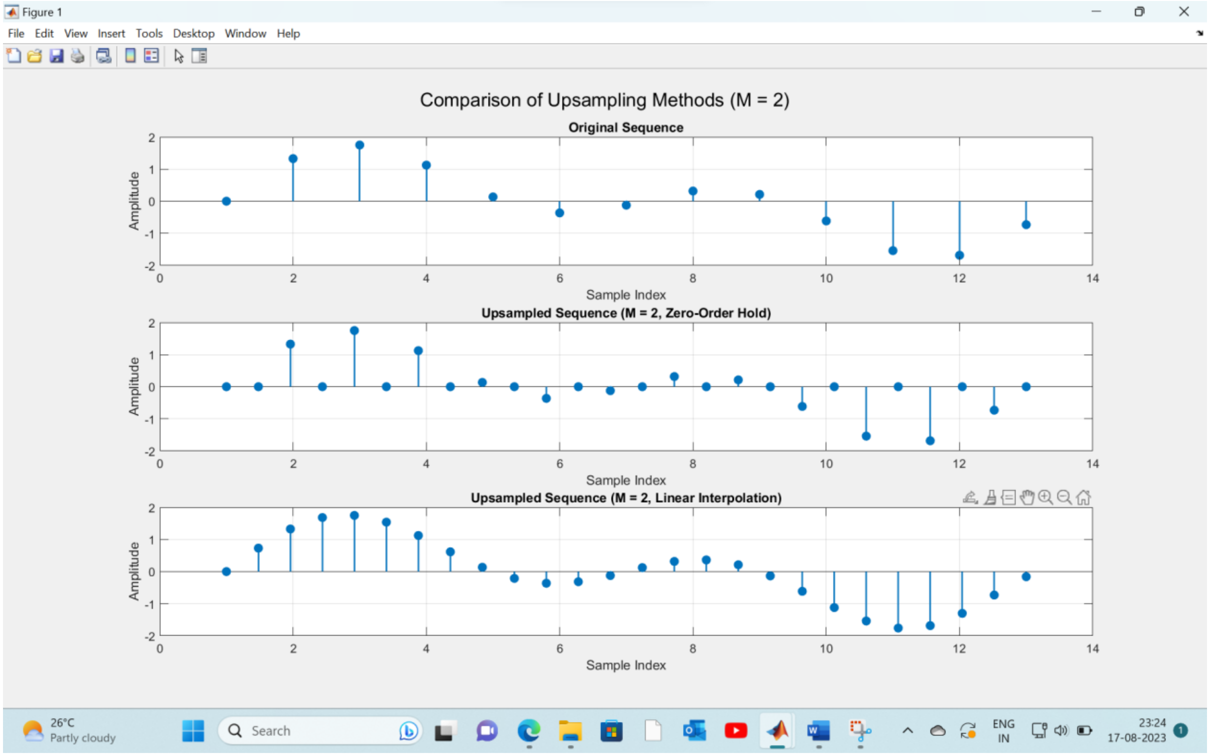
Cons:

*require Convolution, which can be computationally more expensive.

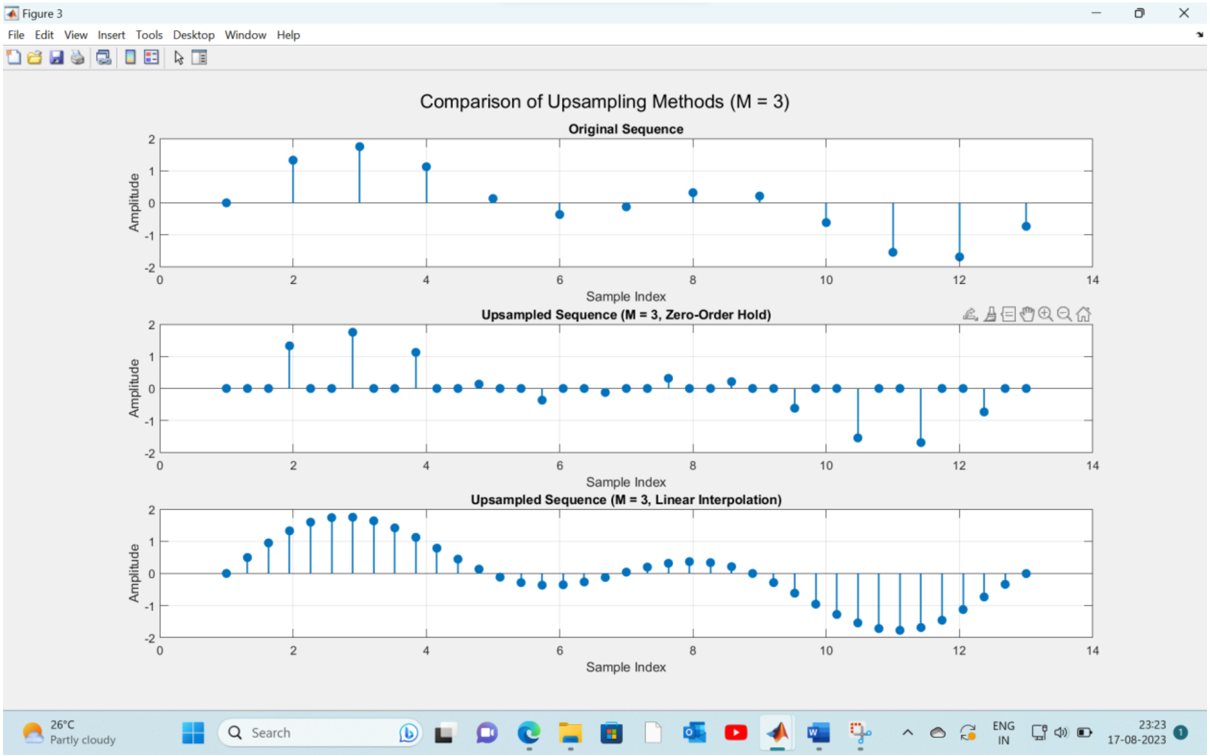
*May slightly delay the trend response compared to cumulative sum.

2.a)

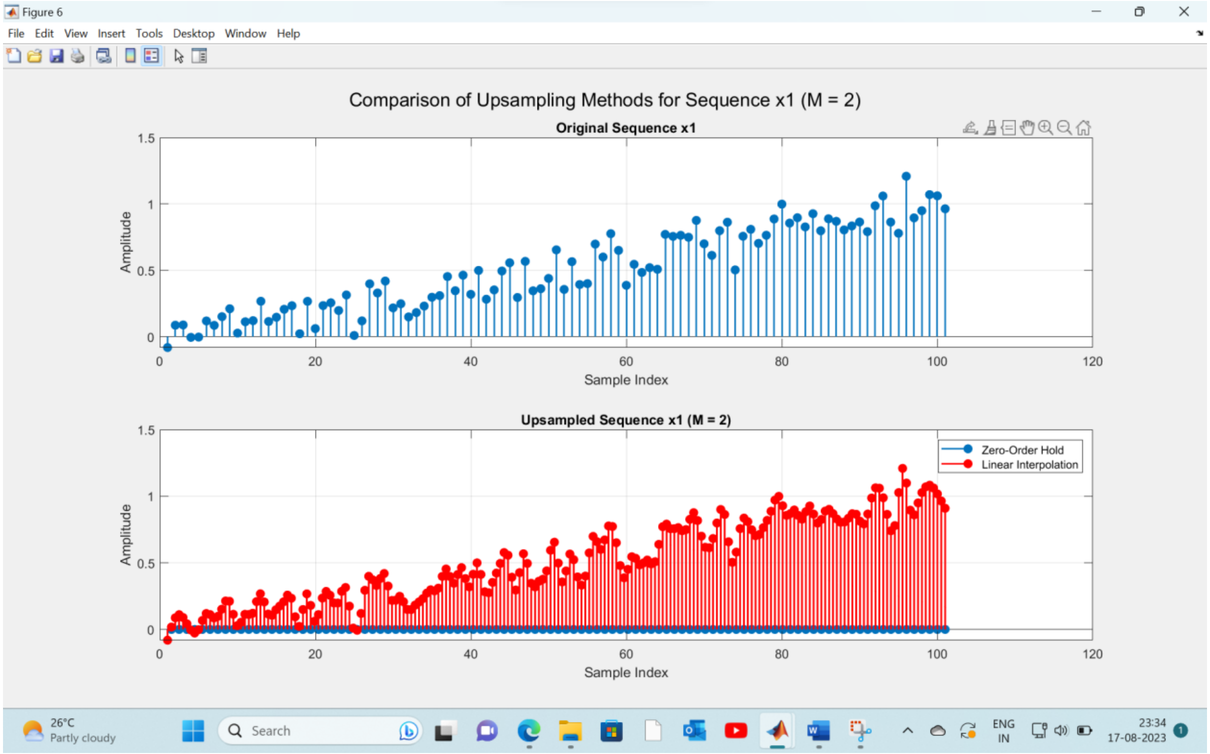
When M=2



When M=3



2.b)



Observation:

In the Zero-order hold interpolation will result in staircase-like pattrens

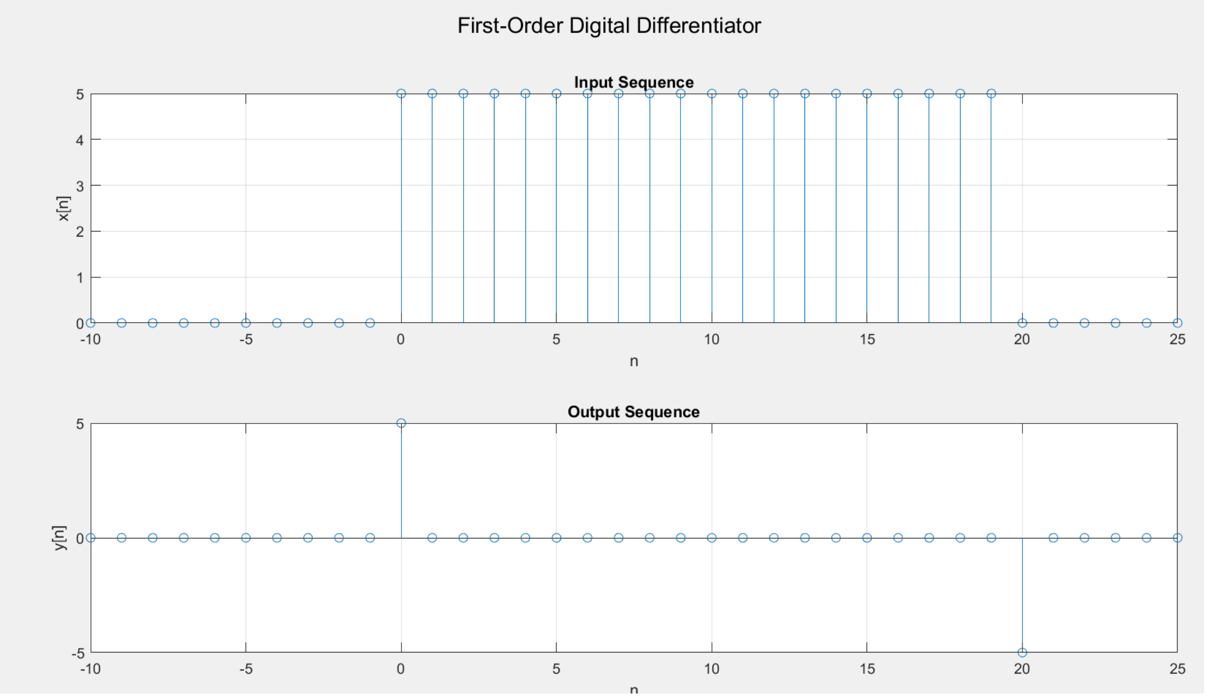
While the linear interpolation will produce smoother curves.

We can observe the affects shape,amplitude and overall appearance of the signal.

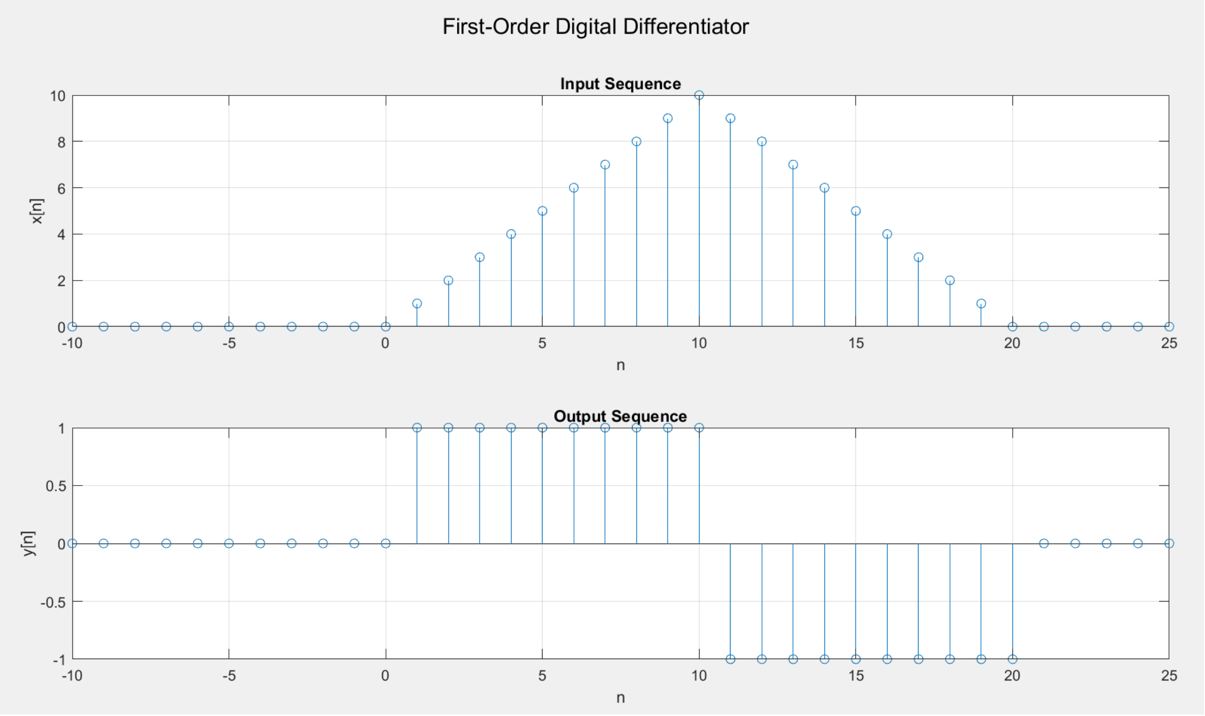
Linear interpolation tends to produce

3.a)

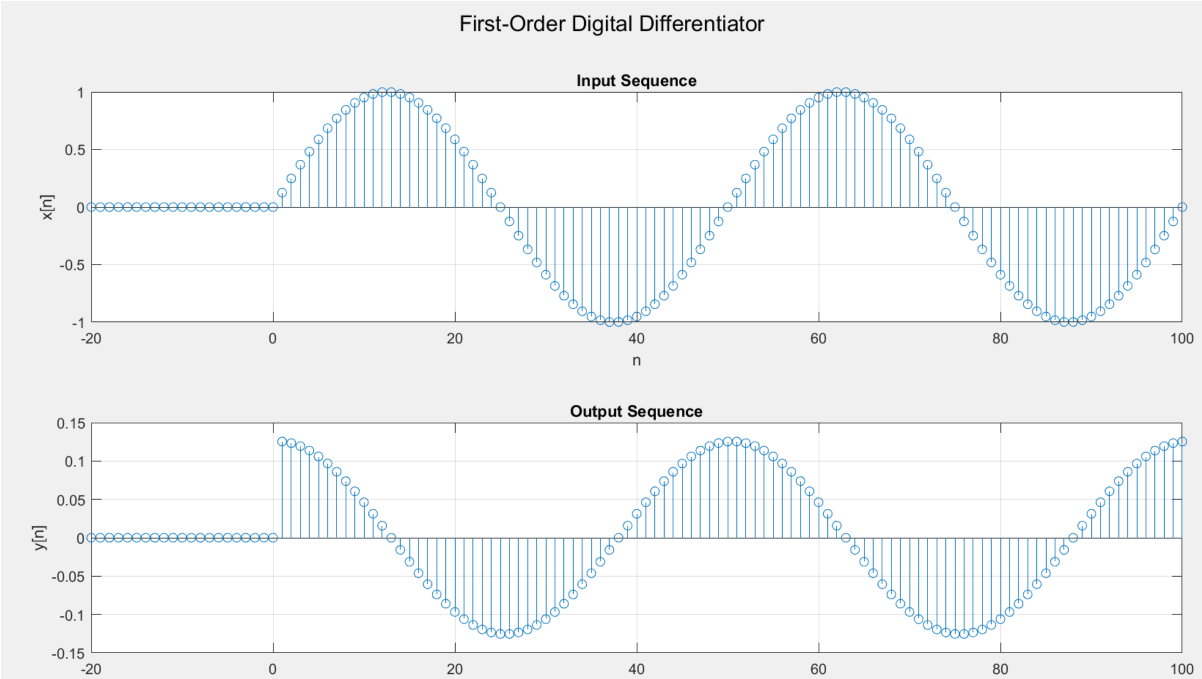
For x[n] = 5(u[n]-u[n-20])



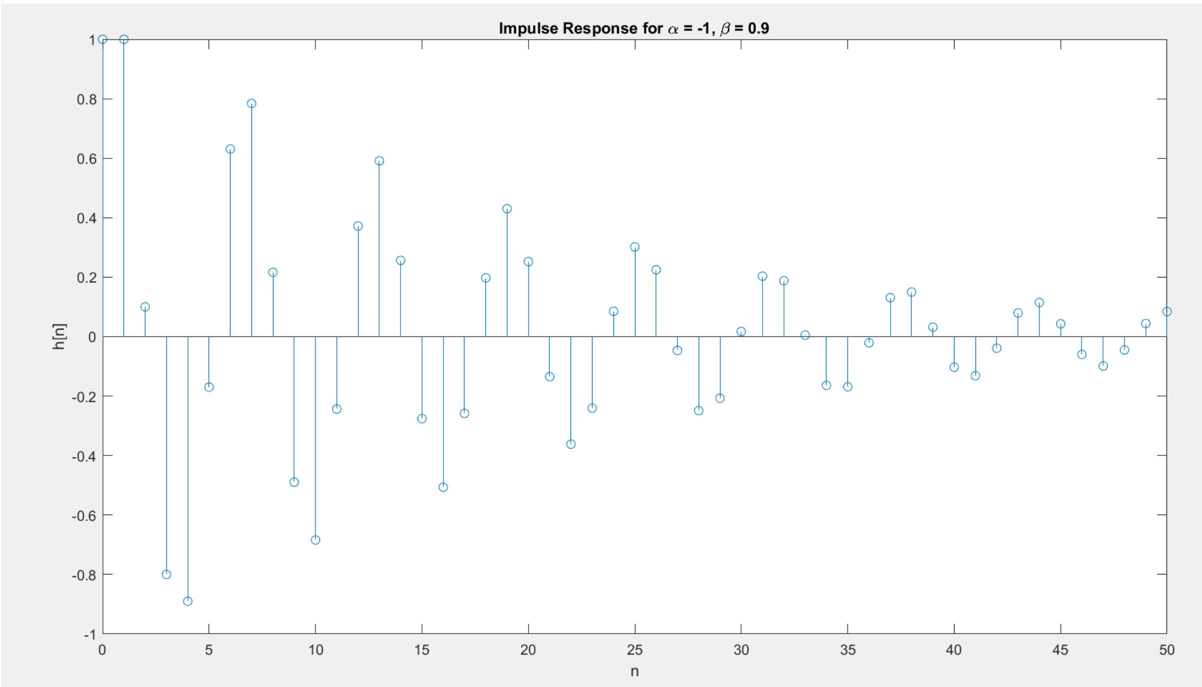
b)for x[n] = n(u[n]-u[n-10]) + (20-n) (u[n-10]-u[n-20])



c)for x[n] = $sin[\ \pi n/\ 25\ ](u[n] - u[n - 100])$

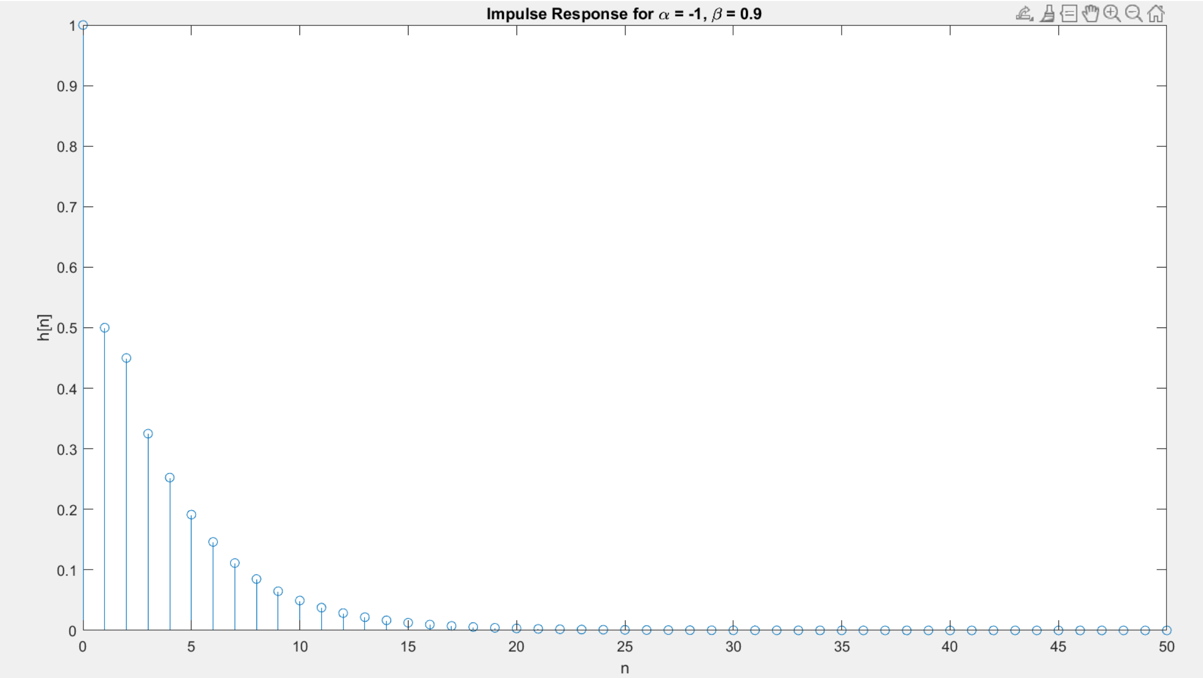


4.a)for α = -1 and β = 0.9

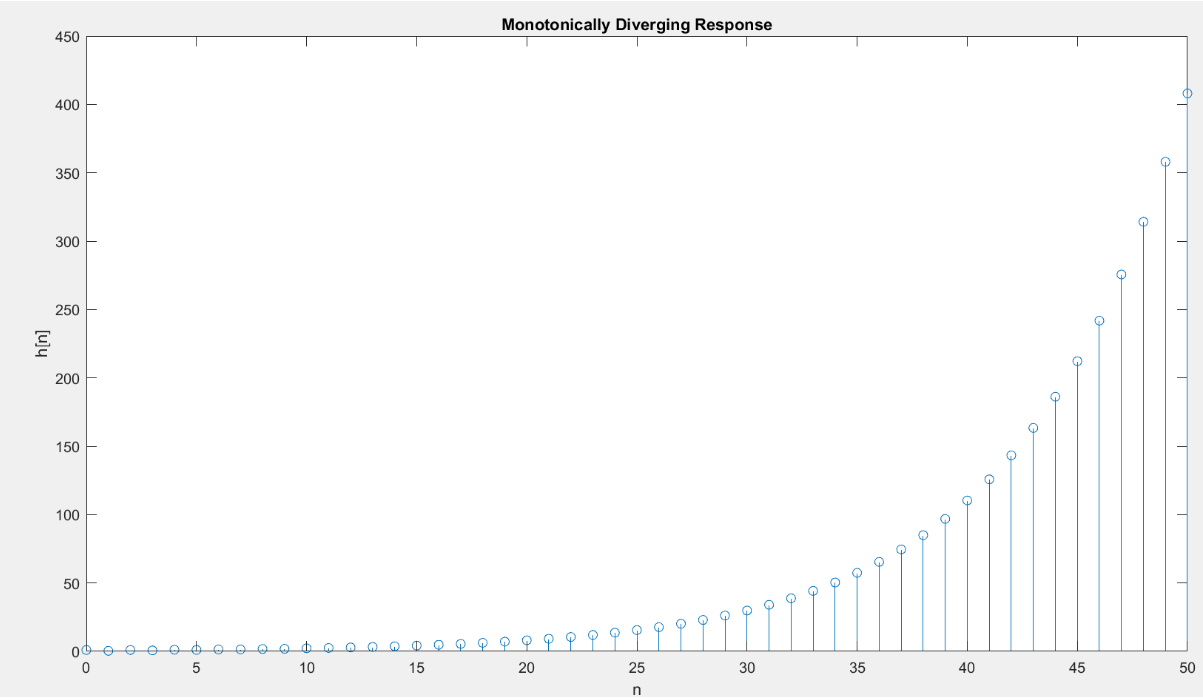


b)The coefficients for the system where h[n] decays monotonically is

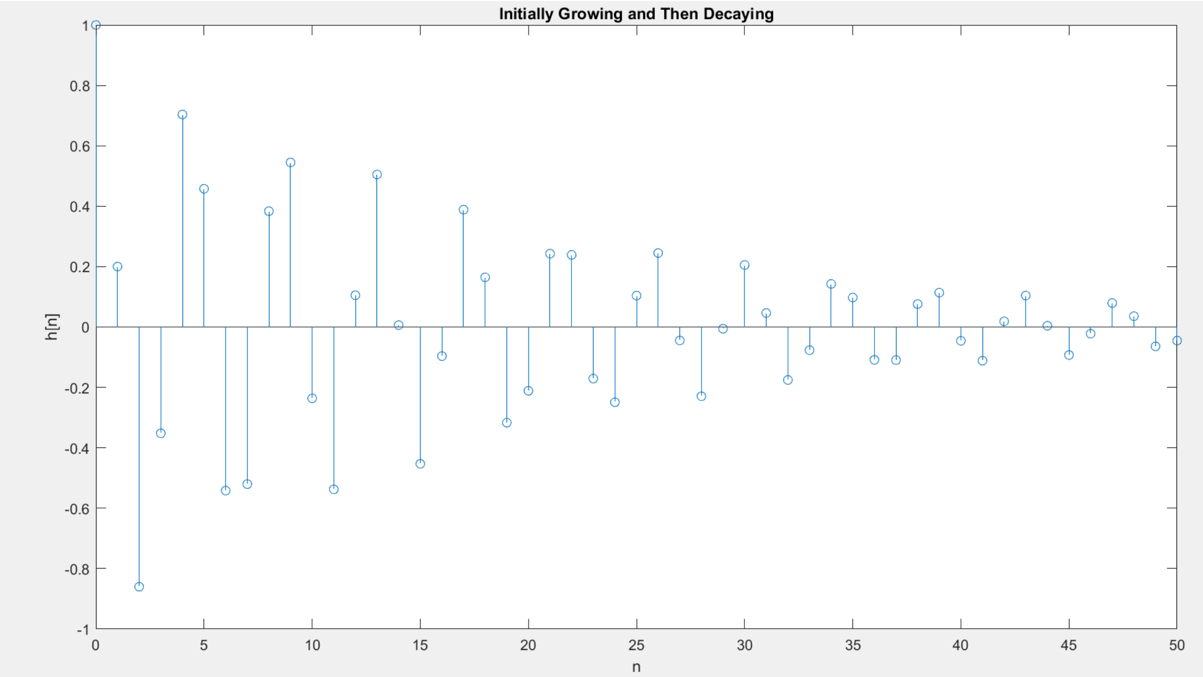
α=-0.5 and β=-0.2



c)coefficients such that h[n] diverges monotonically is when α=-0.35 and β=-0.9



d)initially growing and then decaying



e)oscillating