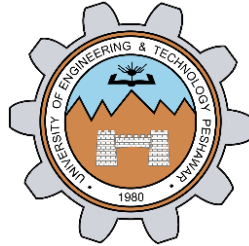


FREQUENCY DOMAIN ANALYSIS

LAB # 08



CSE402L Digital Signal Processing Lab

Submitted by: **Shah Raza**

Registration No: **18PWCSE1658**

Class Section: **B**

“On my honor, as a student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Student Signature: _____

Submitted to: **Engr. Faiz Ullah**

Friday, February 12th, 2021

Department of Computer Systems Engineering
University of Engineering and Technology, Peshawar

Practicals:

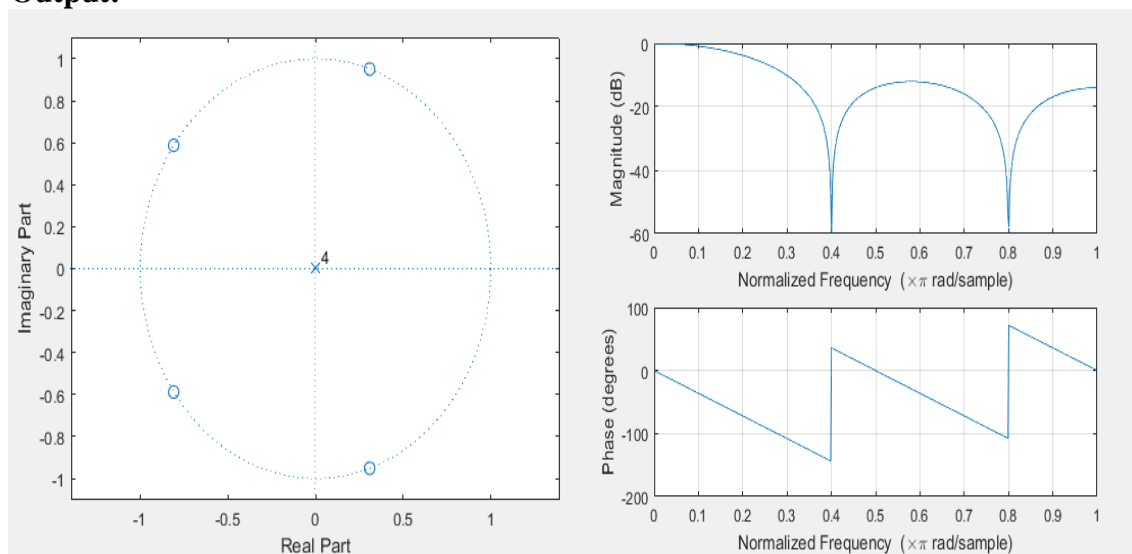
1. Simulate the `zplane()` of a moving-average filter of lengths 5 and 8. Also determine the magnitude and phase response using the `freqz()` command.

Code:

Length 5:

```
clc
clear all
close all
M = 5;
b = (1/M)*ones(1,M);
a = 1;
figure;
zplane(b,a);
figure;
freqz(b,a);
```

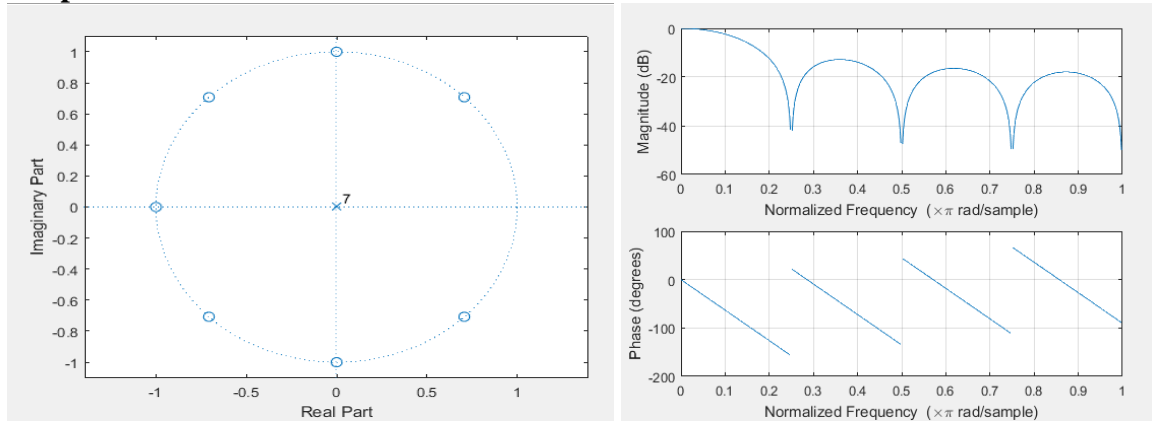
Output:



Length 8:

```
clc
clear all
close all
M = 8;
b = (1/M)*ones(1,M);
a = 1;
figure;
zplane(b,a);
figure;
freqz(b,a);
```

Output:



2. Derive the transfer function of digital system defined by the equation:
 $y[n]-2y[n-1]+y[n-2] = 0.5(x[n]+x[n-1])$
Is the system stable? Find the magnitude and phase response of the system. Also display the pole-zero plot and the impulse response of the current system.

Code:

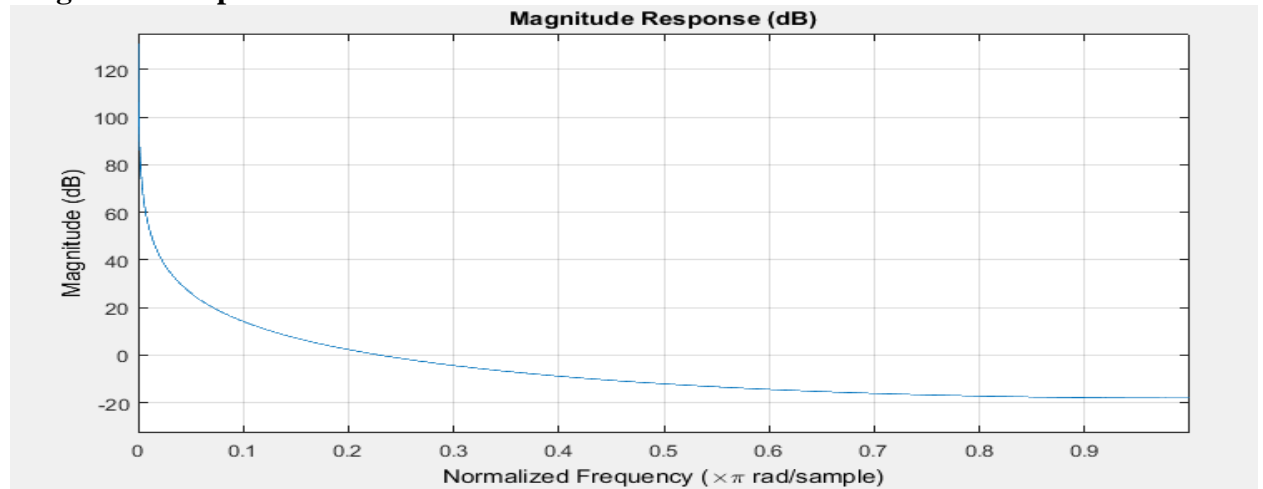
```
clc
clear all
close all
b = 0.5;
a = [1 -2 1];
filt(b,a)
fvtool(b,a);
```

Output:

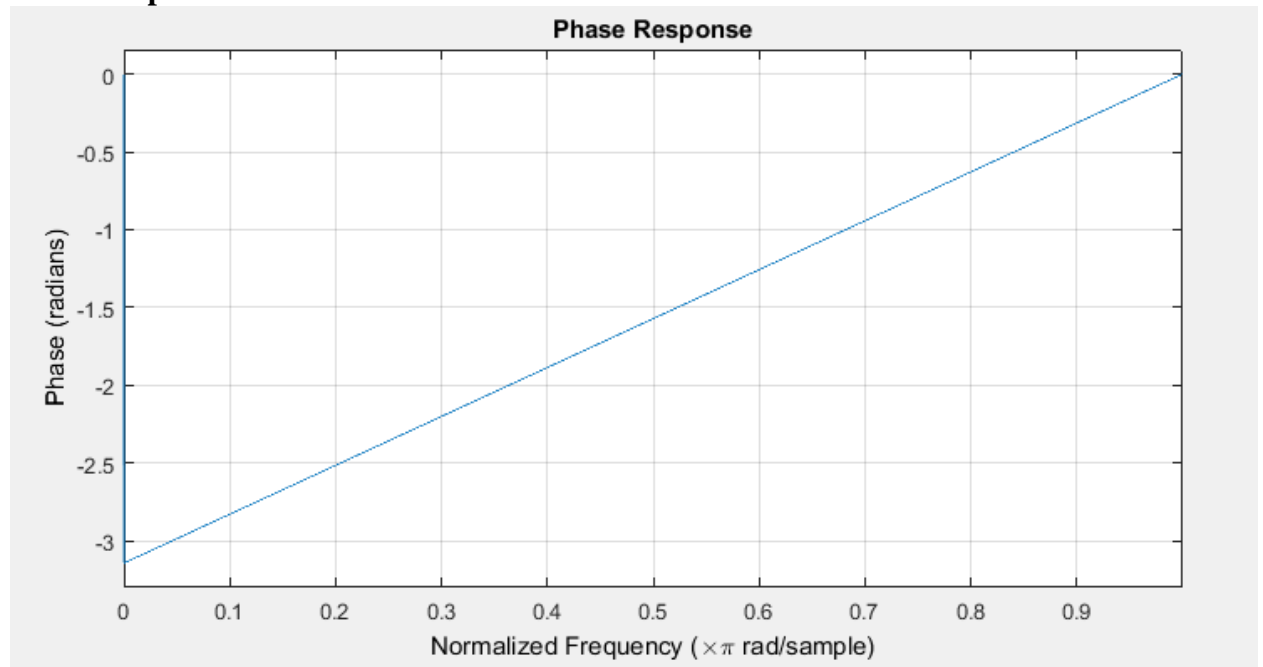
Transfer Function:

```
ans =  
  
      0.5  
-----  
1 - 2 z^-1 + z^-2  
  
Sample time: unspecified  
Discrete-time transfer function.
```

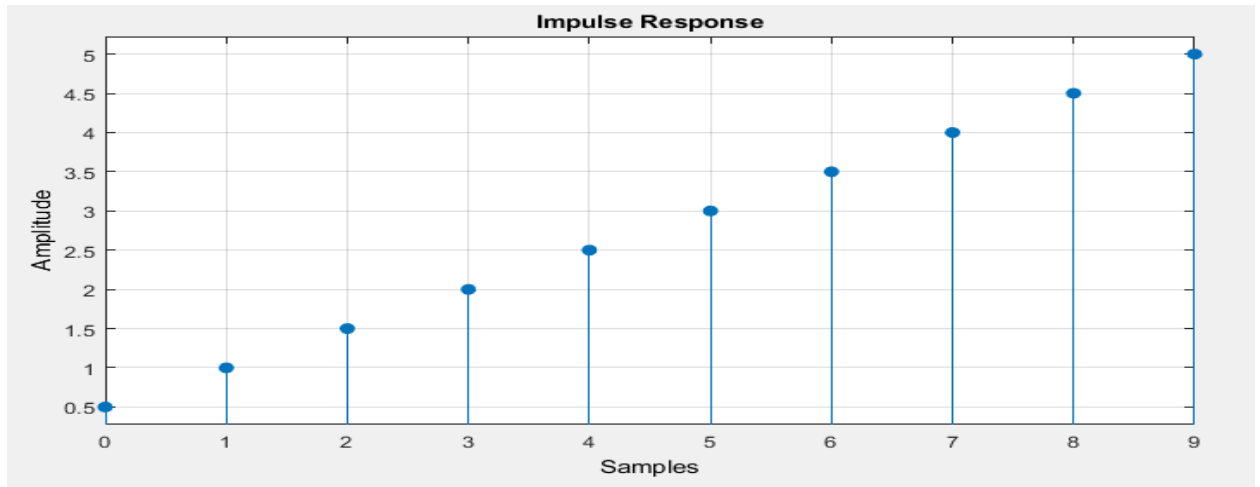
Magnitude Response:



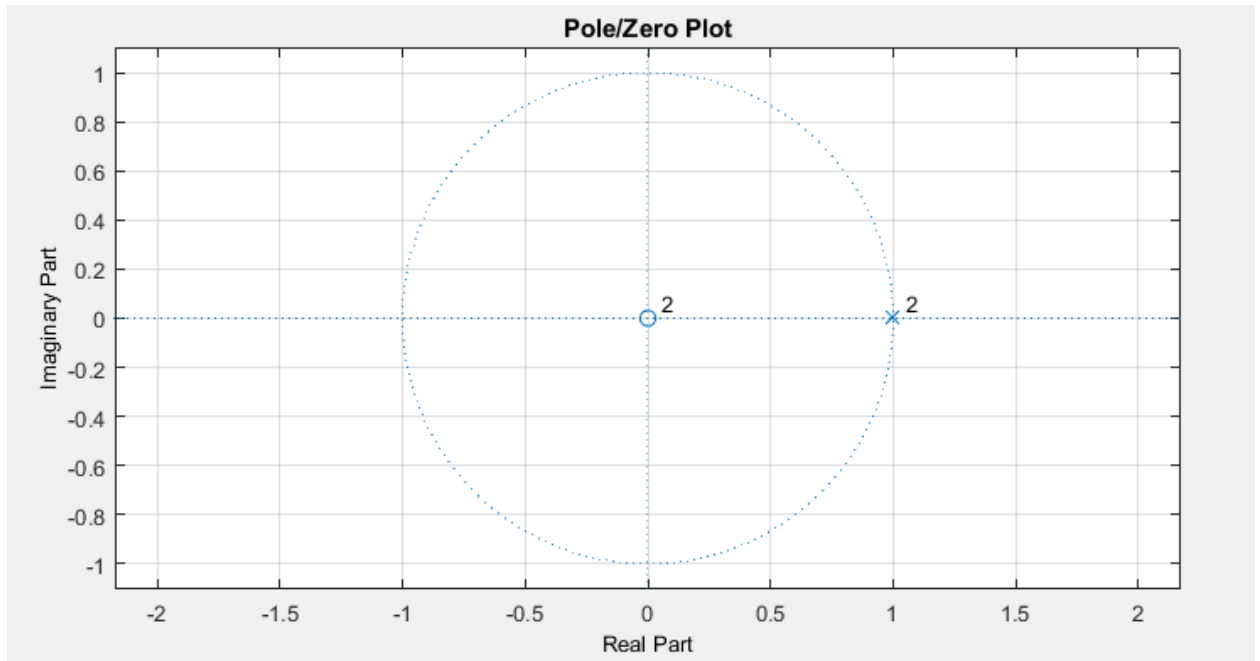
Phase Response:



Impulse Response:



Pole-Zero Plot:



Discussion:

Since all the poles are inside unit circle, so the system is stable.

3. Find the transfer function of the following system:
 $y[n] = 0.1x[n] + 0.2x[n-1] + 0.1x[n-2]$
Is the system stable? Plot the magnitude and phase response.

Code:

```
clc
clear all
close all
b = [0.1 0.2 0.1];
a = 1;
filt(b,a)
fvtool(b,a);
```

Output:

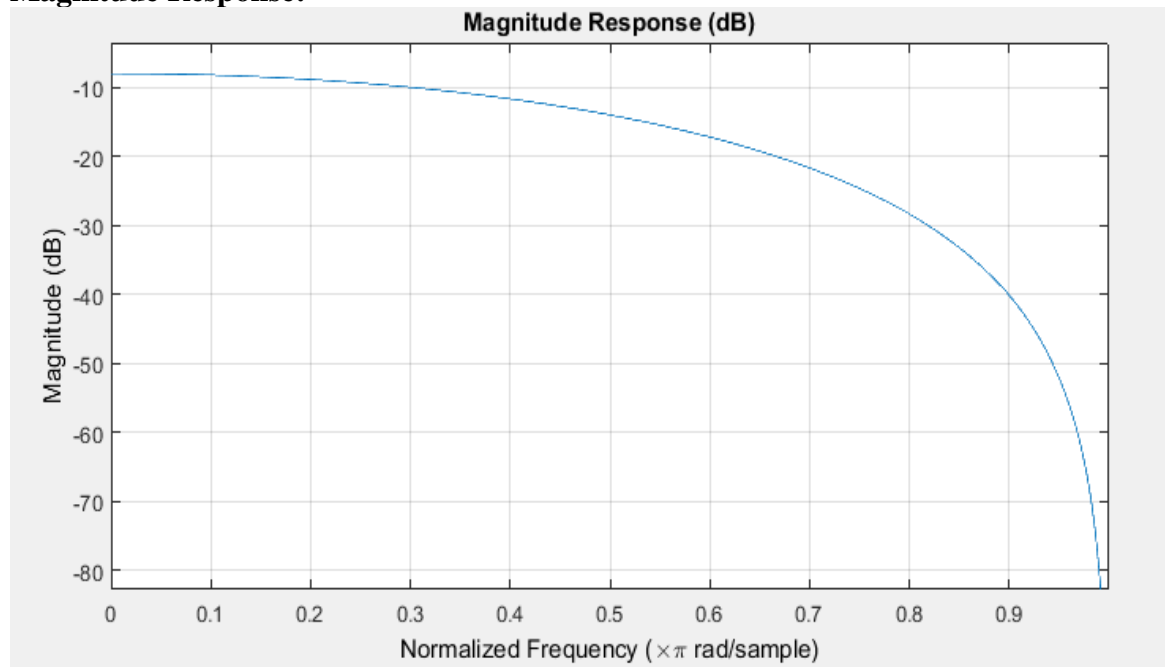
Transfer Function:

```
ans =

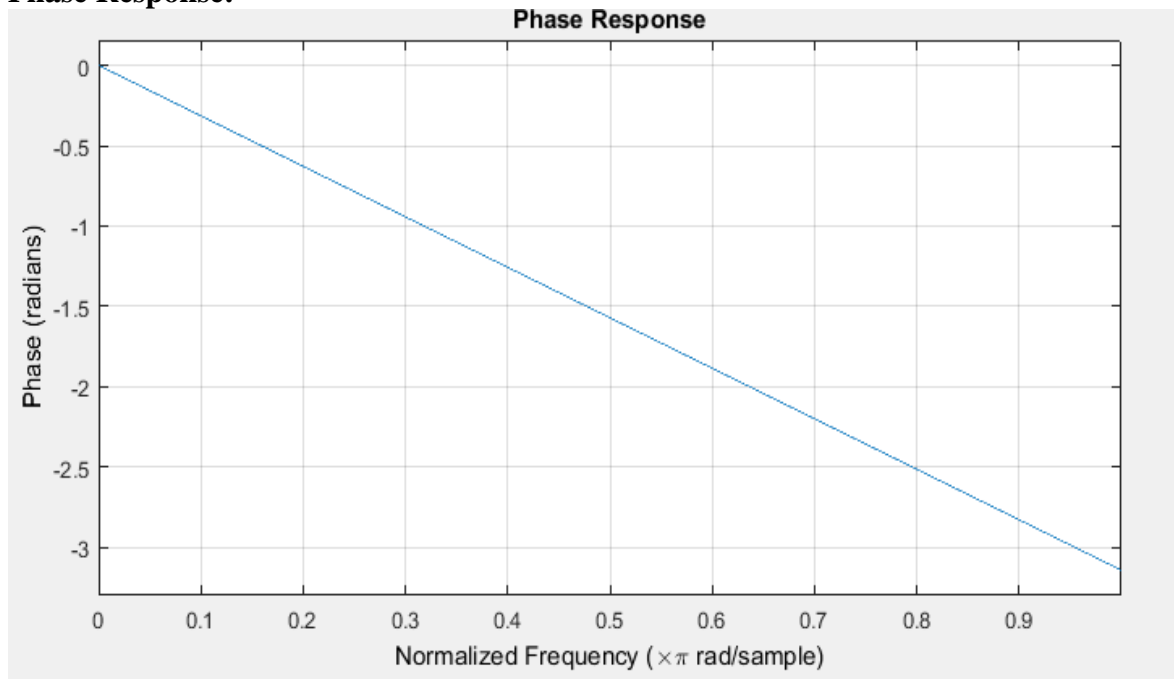
    0.1 + 0.2 z^-1 + 0.1 z^-2

Sample time: unspecified
Discrete-time transfer function.
```

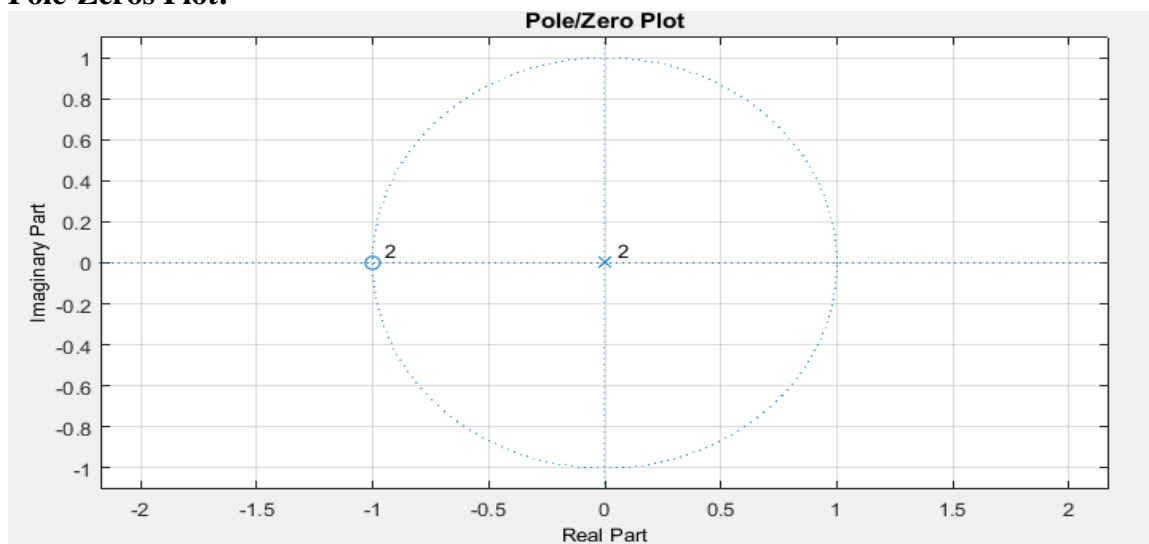
Magnitude Response:



Phase Response:



Pole-Zero Plot:



Discussion:

Since all the poles are inside unit circle, so the system is stable.