Digital Signal Processing Lab Assignment 3

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**Question 1-A**

**Code**

num1 = [1 -2 2 -1];

denom1 = [1;0.5;0.2];

poles2 = poly([1 0.5 0.2]);

roots(num1);

msg1 =( ' Roots of Numerator ' );

disp (msg1)

disp(roots(num1));

msg2 =( ' Roots of Denomenator ' );

disp (msg2)

disp (denom1);

figure

zplane(roots(num1),denom1);

title ( 'Z-Plane Method');

Chart

Description automatically generated

Text, letter

Description automatically generated

Chart

Description automatically generated

The System is marginally stable because there is one of the poles of the system which exists at (1) and the other poles are smaller than (1).

**Question 1-B**

**Code**

num1 = [1 -2 2 -1];

poles2 = poly([1 0.5 0.2]);

f = tf(num1,poles2);

figure

pzmap (f)

x = [1 zeros(1,49)];

y = filter(num1,poles2,x);

disp (y)

Calendar

Description automatically generated with low confidence

**Question 2**

**Code**

y1 = [1 -2.8 3.02 -1.468 0.27];

x1 = [0.03 -0.02 0.01];

f = tf(x1,y1);

figure

pzmap (f)

msg1 =( ' Roots of Numerator ' );

disp (msg1)

disp (roots(x1))

msg2 =( ' Roots of Denomenator ' );

disp (msg2)

disp (roots(y1))

Chart, scatter chart

Description automatically generated

Text, letter

Description automatically generated

The System is stable because the magnitude of all the roots is smaller than (1).

**Question 2-i**

**Code**

in1 = [5 5\*ones(1,40)];

out1 = filter(x1,y1,in1);

disp (out1)

A picture containing text

Description automatically generated

**Question 2-ii**

**Code**

Y = [-0.2 0.3 0 0];

xic = filtic(x1,y1,Y);

yic = filter(x1,y1,in1,xic);

disp(yic)

Text

Description automatically generated with medium confidence

**Question 3-A**

**Code**

num1 = [0.74 -2.544 2.5126];

denom1 = [1 0 0.64];

roots(num1);

msg1 =( ' Roots of Numerator ' );

disp (msg1)

disp(roots(num1));

msg2 =( ' Roots of Denomenator ' );

disp (msg2)

disp (denom1);

f = tf(num1,denom1);

figure

pzmap (f)

delta1 = [1 zeros(1,49)];

impresponse = filter(num1,denom1,delta1);

disp(impresponse)

Chart, box and whisker chart

Description automatically generated

**Graphical user interface, text

Description automatically generated**

**Calendar

Description automatically generated with low confidence**

**Question 3-B**

**Code**

n = 0:1:49;

in1 = (2\*(0.8).^n)-(2\*(0.3).^n);

y = filter(num1,denom1,in1);

disp (y)

syms Z n

in1 = ztrans((2\*(0.8).^n)-(2\*(0.3).^n));

msg3 = (' X(z)');

disp(msg3);

disp(in1);

out1 = in1\*((0.74\*(Z^2))-(2.544\*Z)+2.5216)/((Z^2)+0.64);

msg4 = (' H(z)');

disp(msg4);

disp(out1);

out1num = [0.74 2.544 2.5216 0];

out1denom = [1 -1.1 0.88 -0.704 0.1536];

zplane(roots(out1num), roots(out1denom));

**Input x(n)**

Calendar

Description automatically generated with medium confidence

**Chart

Description automatically generated**

**Table

Description automatically generated**