**LAB#12**

**Object:** Designing of filter using MATLAB.

**TASK #01:**

Write a script file to convert the following continuous system in to discrete time using Ts = 0.1sec.

**(a)A(s)=3S/S+1**

**Coding:**

n=[3 0]

d=[1 1]

s=tf(n,d)

ds=c2d(s,0.1)

subplot(2,1,1)

step(s)

subplot(2,1,2)

step(ds)

**Result:**

ds =

3 z - 3

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z - 0.9048

Sample time: 0.1 seconds

Discrete-time transfer function.

**Graph:**

**(b)(s+2)/(s^2+3s+2)**

**Coding:**

n=[0 1 2]

d=[1 3 2]

s=tf(n,d)

ds=c2d(s,0.1)

subplot(2,1,1)

step(s)

subplot(2,1,2)

step(ds)

**Result:**

ds =

0.09516 z - 0.07791

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z^2 - 1.724 z + 0.7408

Sample time: 0.1 seconds

Discrete-time transfer function.

**Graph:**



**Task 2:**

Write a script file to reconstruct the continuous system from the discrete system obtained in task 1.

1. **A(s)=3S/S+1**

**Coding:**

n=[3 -3]

d=[1 -0.9048]

s=tf(n,d,0.1)

sd=d2c(s)

subplot(2,1,1)

step(s)

subplot(2,1,2)

step(sd)

**Graph:**

1. **(s+2)/(s^2+3s+2)**

**Coding:**

n=[0 0.09516 -0.07791]

d=[1 -1.724 0.7408]

s=tf(n,d,0.1)

sd=d2c(s)

subplot(2,1,1)

step(s)

subplot(2,1,2)

step(sd)

**Graph:**

**Task 3:**

Write a script file to find the z-transform of the following discrete time signals

**(a)x(n)=(1/2)^n u(n)**

**Coding:**

syms n

f=(1/2)^n

F=ztrans(f)

A=collect(F)

pretty(A)

**Result:**

A =

(2\*z)/(2\*z - 1)

2 z

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2 z – 1

**(b)y(n)={(1/2)^n+ (-1/3)n}u(n)**

**Coding:**

syms n

f=[(1/2)^n+(-1/3)^n]

F=ztrans(f)

A=collect(F)

pretty(A)

**Result:**

A =

(12\*z^2 - z)/(6\*z^2 - z - 1)

2

12 z - z

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2

6 z - z – 1

**Task 4:**

Write a script file to find the rational z transform from the partial fraction expression.

**H(z)=[0.5/(1-0.9z^-1)]+[0.5/(1-0.9z^-1)]+[0.25/(1-0.9z^-1)]**

**Coding:**

r=[0.25 0.5 0.5]

p=[-0.9 -0.9 -0.9]

k=[]

[n,d]=residuez(r,p,k)

**Result:**

n =

1.2500 0.9000 0.2025

d =

1.0000 2.7000 2.4300 0.7290

**Task 5:**

Write a script file to find the pole-zero diagram & frequency response for the z-transform transfer function of the given system

1. **Zeros are at (0,-1.5), poles are at (-0.35360.3536i) & gain constant is 2.**

**Coding:**

z = [0 -1.5];

p = [-0.3536+0.3536i -0.3536-0.3536i];

k= [2];

[n,d]=zp2tf(z,p,k)

fvtool(n,d,'polezero')

freqz(n,d)

**Graph:**



**Conclusion:** In this lab I learnt how to design the filters and how to convert the pole zeros in to z transform and draw the pole zero map.