THE UNIVERSITY OF TEXAS AT ARLINGTON, TEXAS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 5327 - 001

SYSTEM IDENTIFICATION & ESTIMATION

HW # 2
ASSIGNMENT

by

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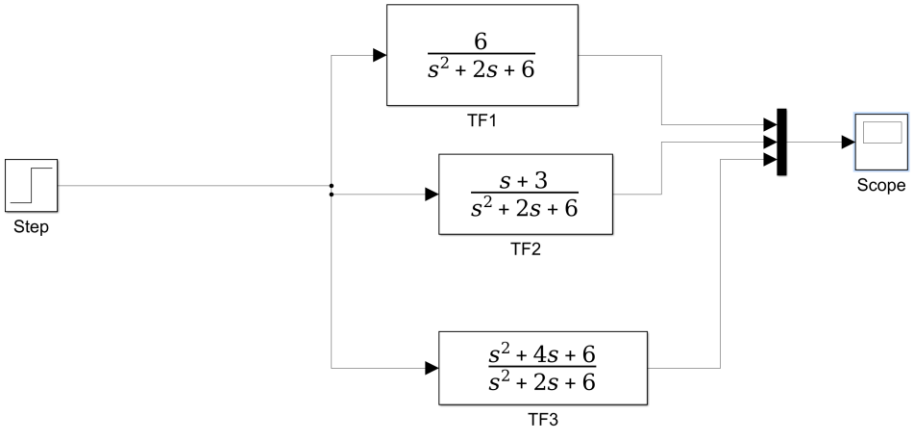
Presented to

Prof. Michael Niestroy

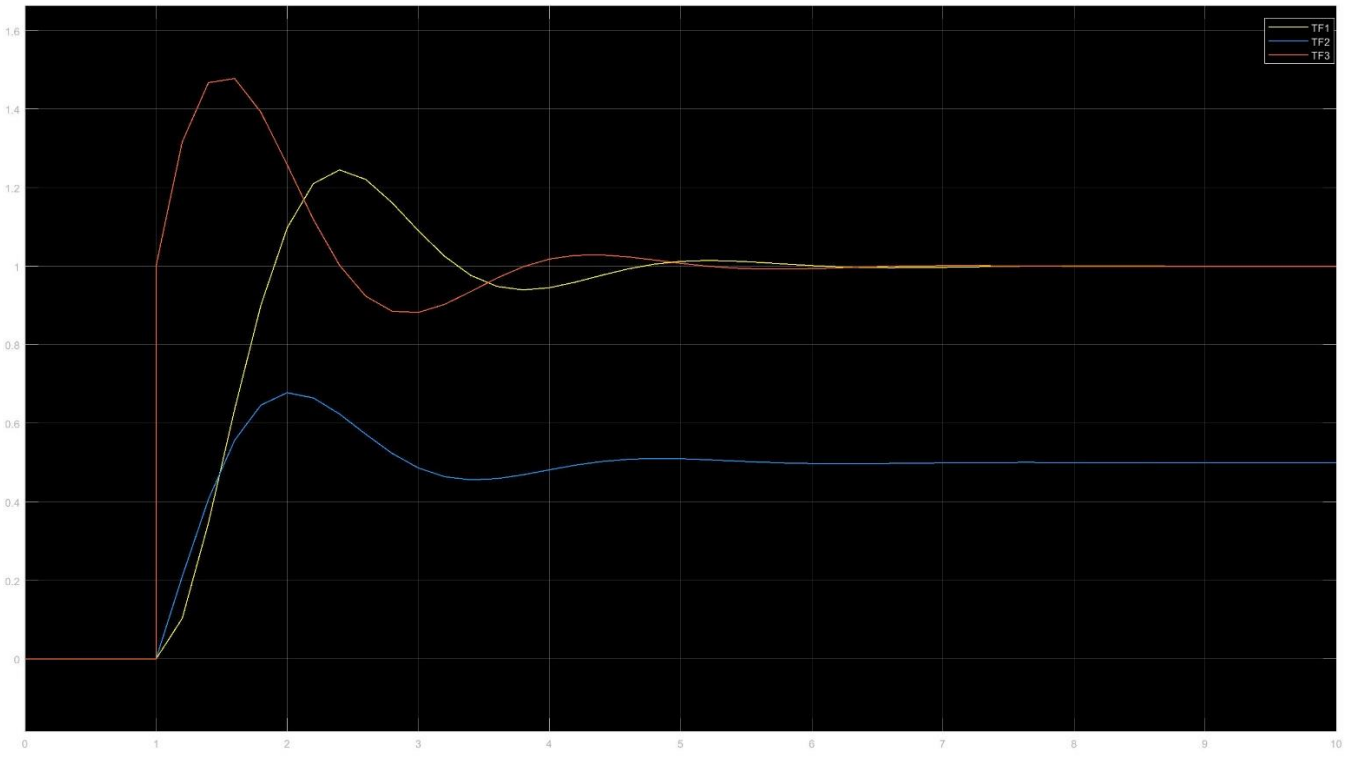
Sept 22, 2017

Problem1 -

a) Block Diagram -



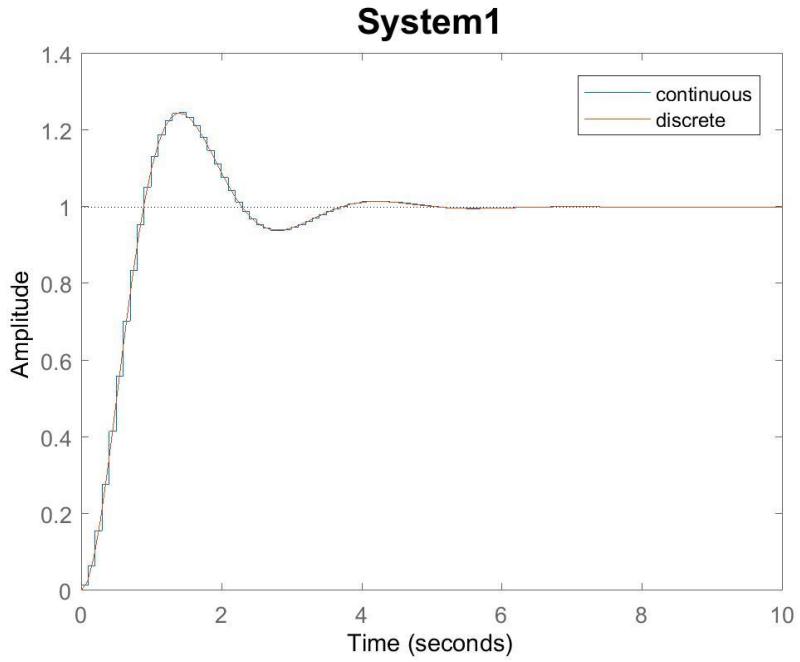
Response -

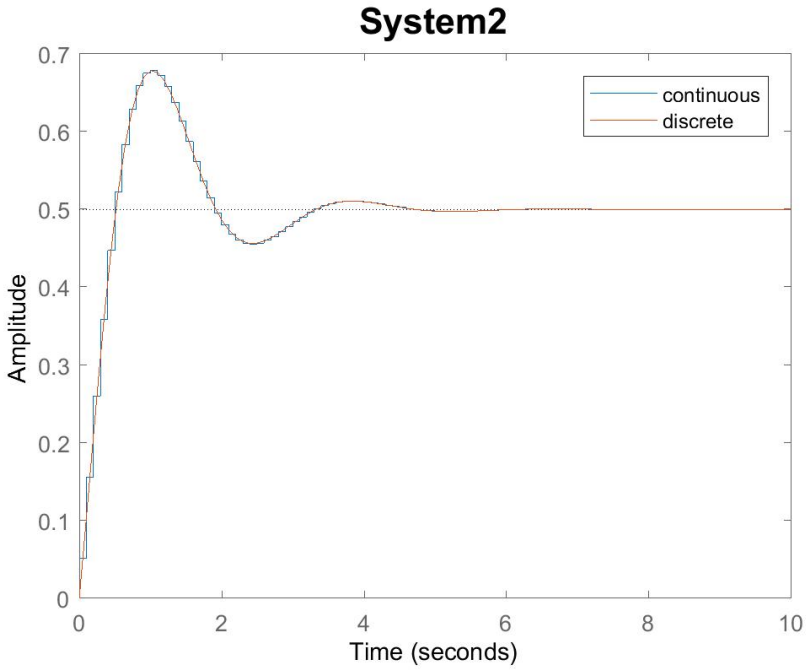


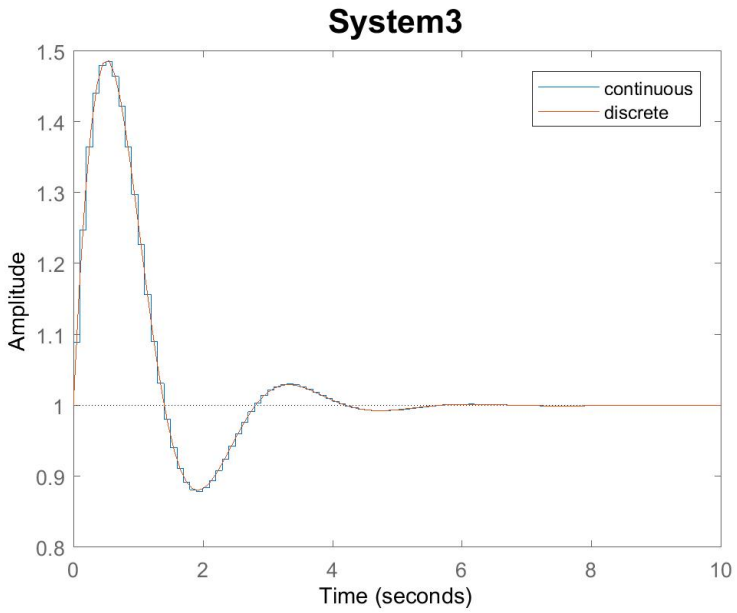
b) MATLAB CODE

```
Num1=6;
Den1=[1 2 6];
Num2=[1 3];
Den2=[1 2 6];
Num3=[1 4 6];
Den3=[1 2 6];


sys1=tf(Num1,Den1);
sys2=tf(Num2,Den2);
sys3=tf(Num3,Den3);

t=10;

sysd1=c2d(sys1,0.1,'tustin');
sysd2=c2d(sys2,0.1,'tustin');
sysd3=c2d(sys3,0.1,'tustin');

figure
step(sysd3,sys3,t)
title('System3','fontsize',16);
legend('continuous','discrete');

figure
step(sysd2,sys2,t)
title('System2','fontsize',16);
legend('continuous','discrete');

figure
step(sysd1,sys1,t)
title('System1','fontsize',16);
legend('continuous','discrete');
```

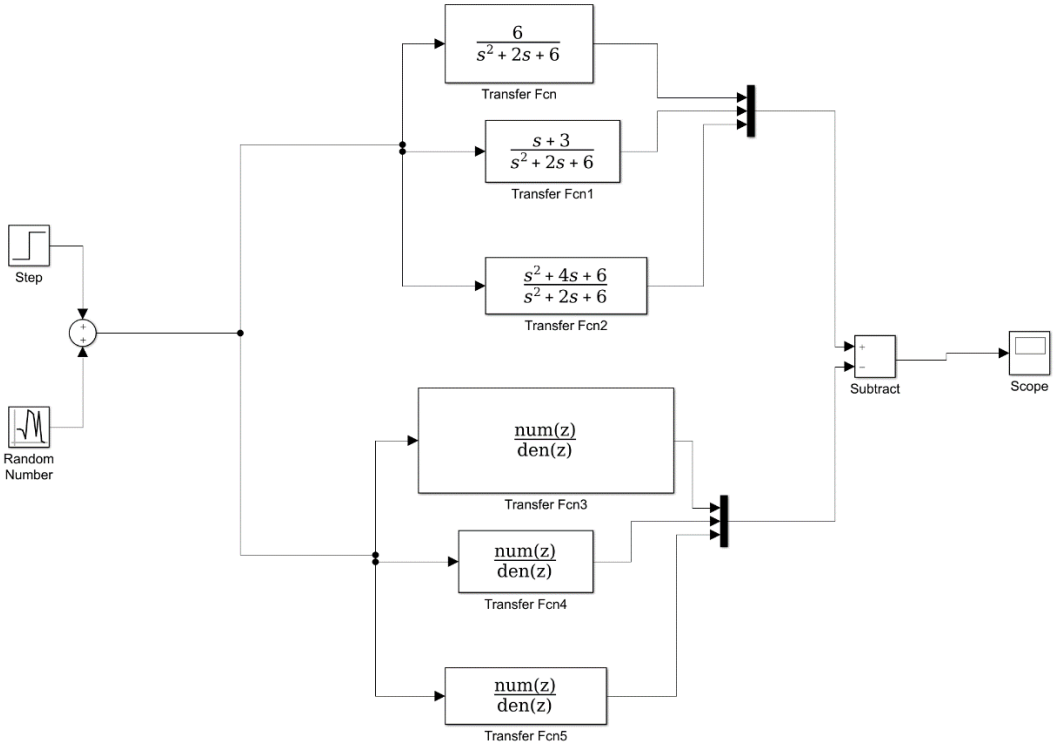
The various responses are as follows -


System1
continuous
discrete
Amplitude
Time (seconds)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
2
4
6
8
10

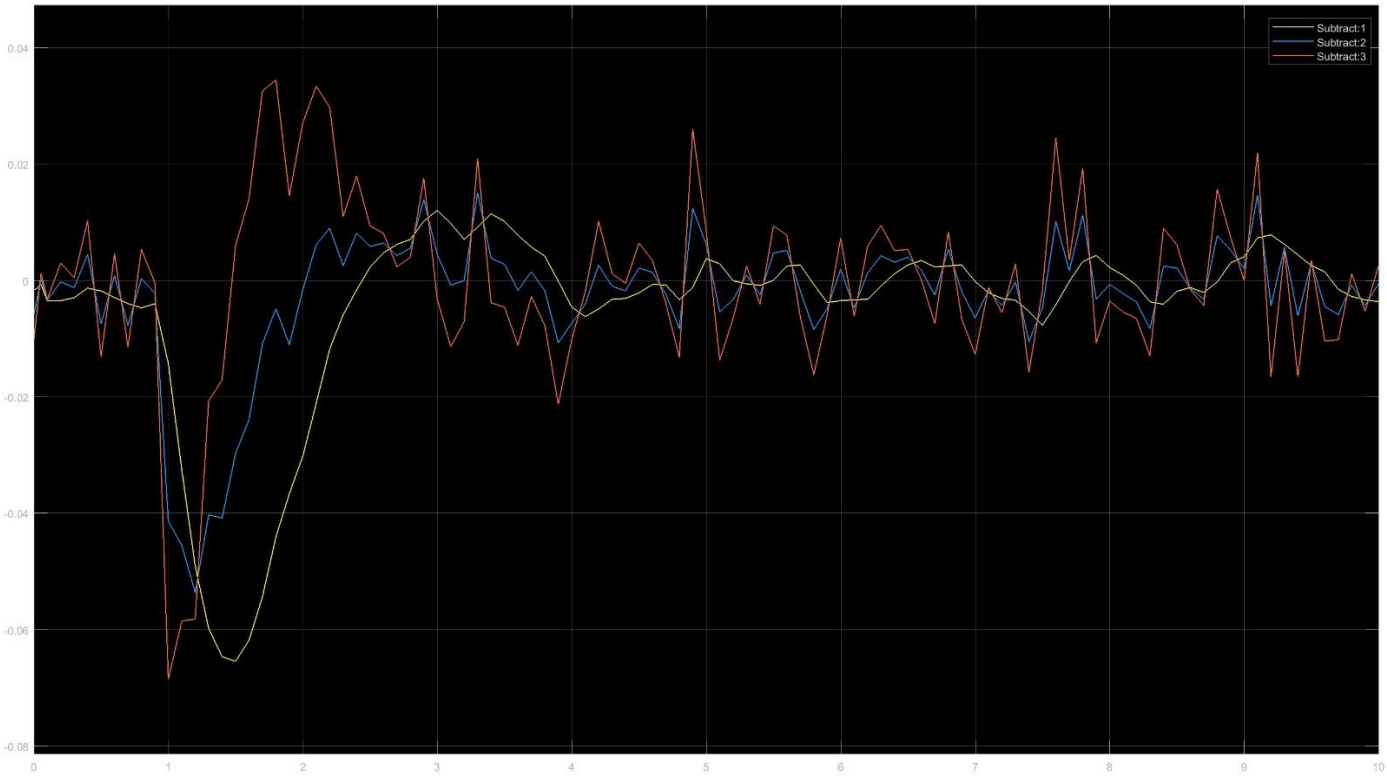

System2
continuous
discrete
Amplitude
Time (seconds)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0
2
4
6
8
10



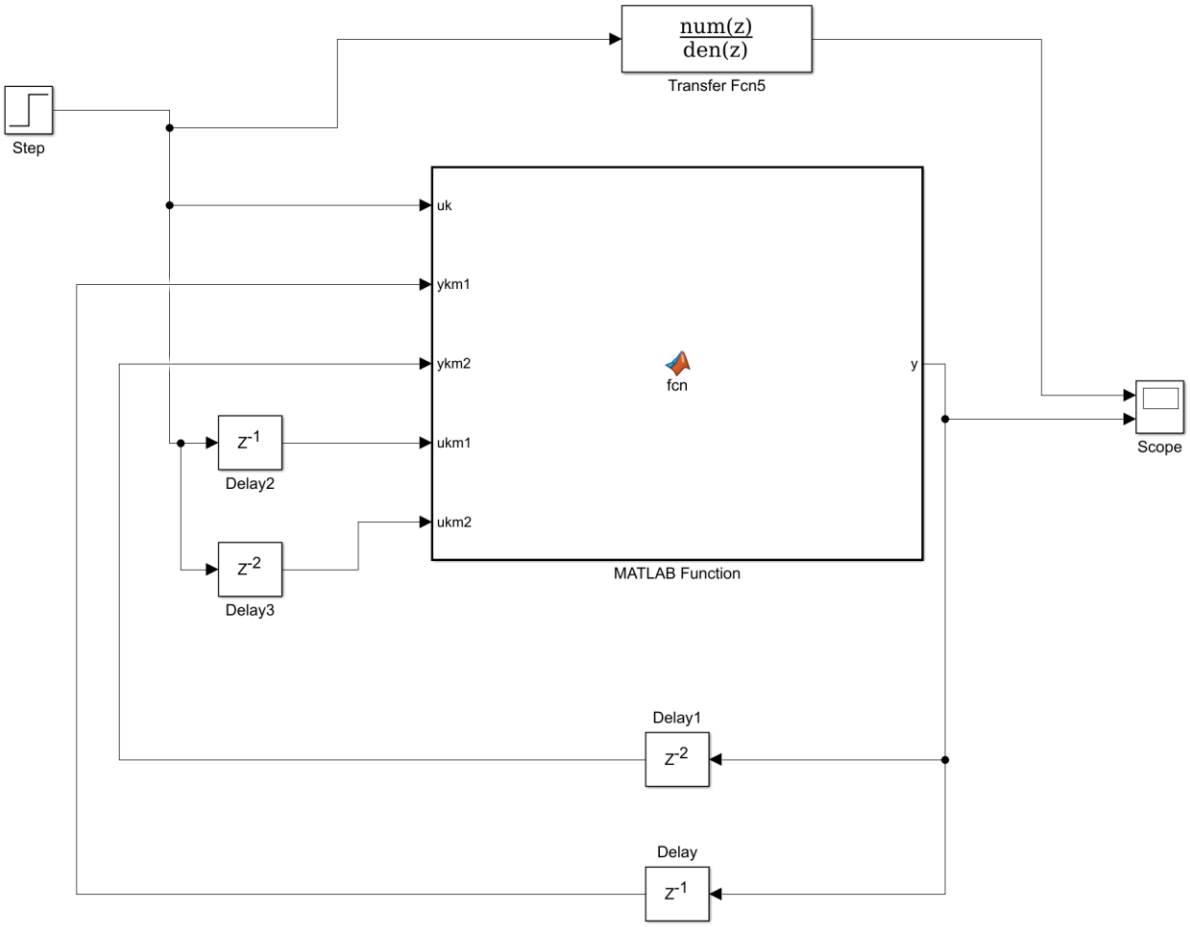
C) Block Diagram



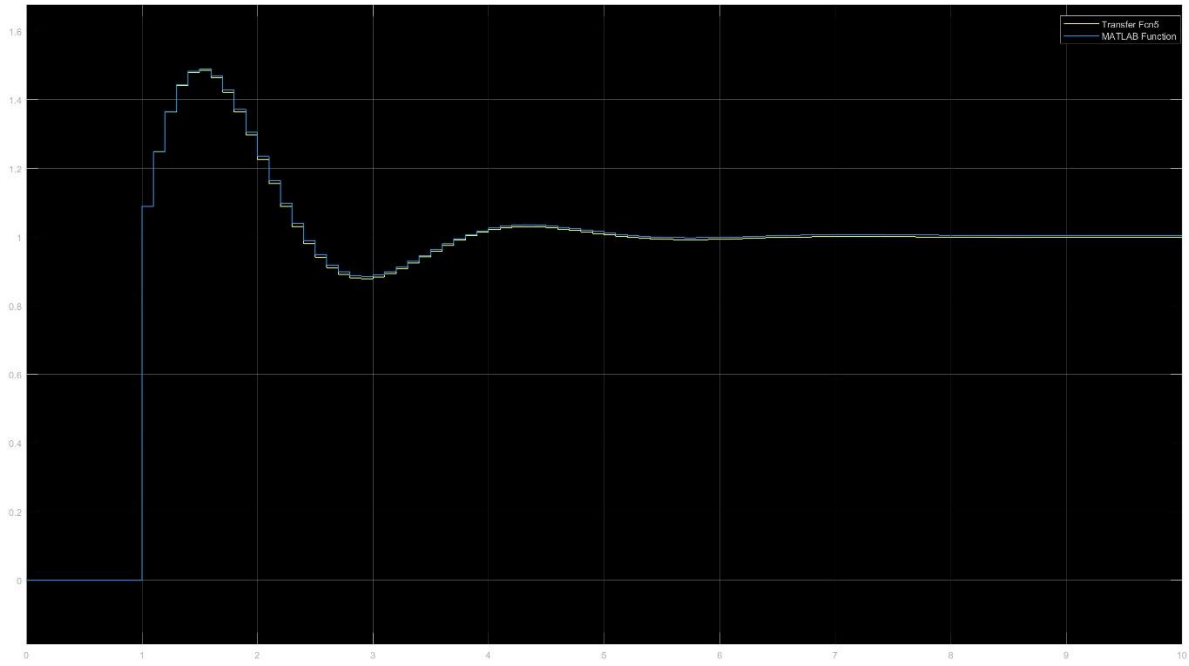
Response -


Subtract:1
Subtract:2
Subtract:3
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
0
1
2
3
4
5
6
7
8
9
10

d) Block Diagram



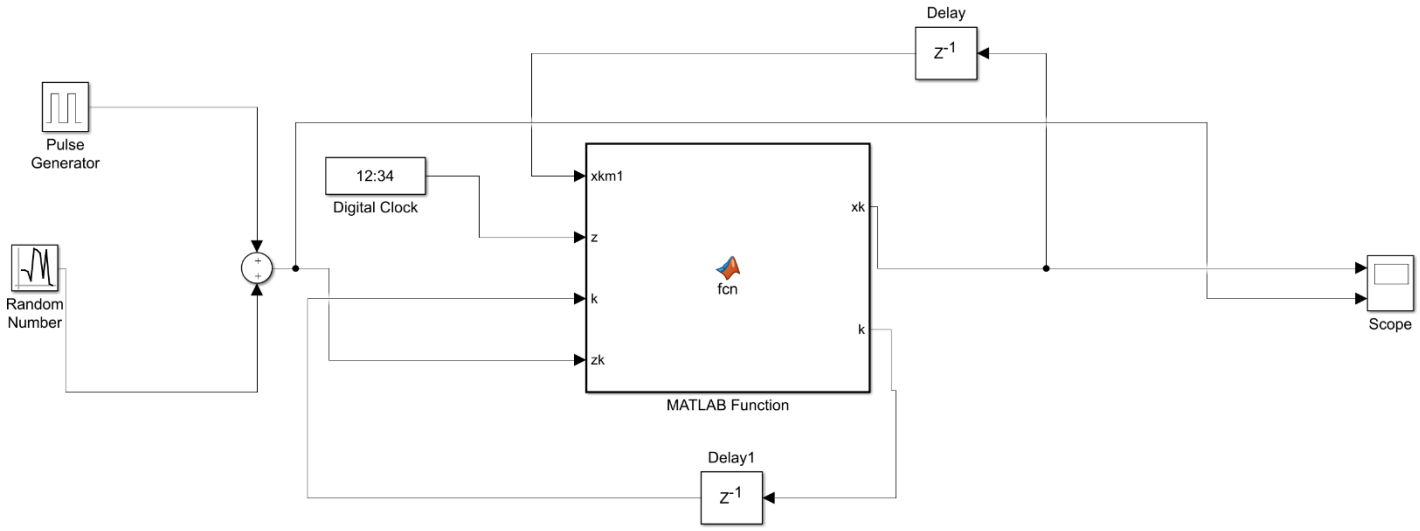
The response is as follows -



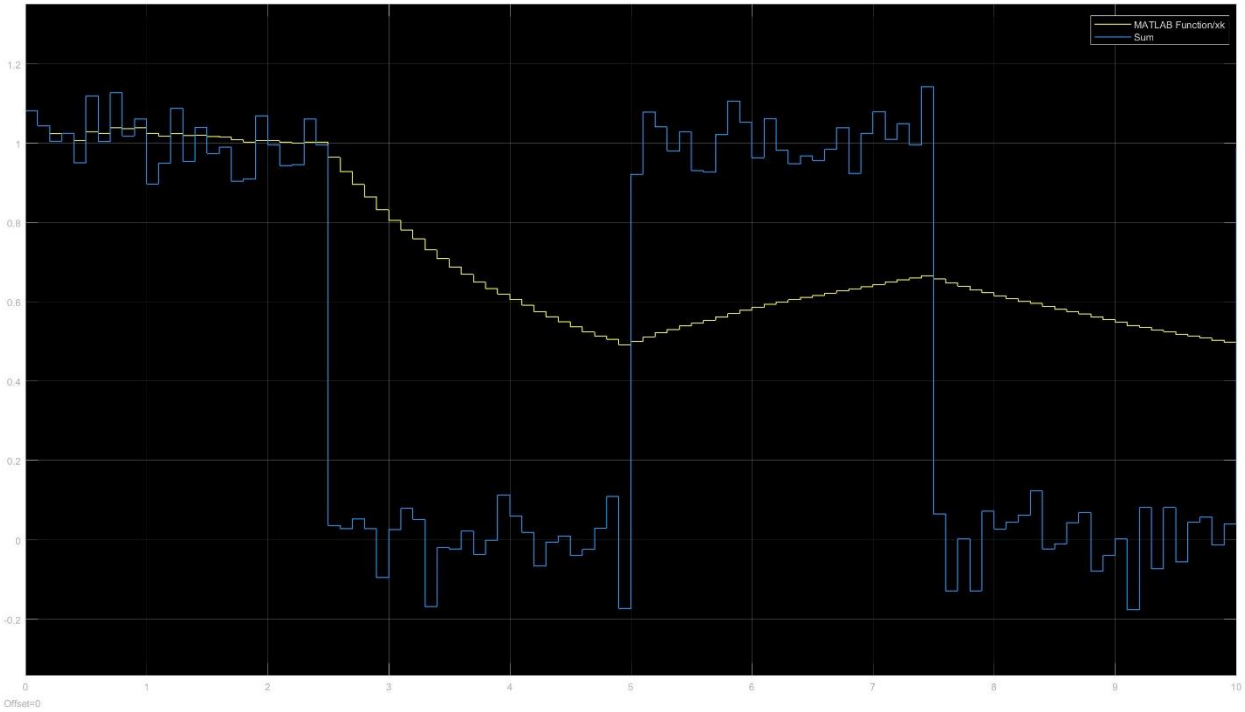
Problem 2

a)

Block Diagram -



Response -



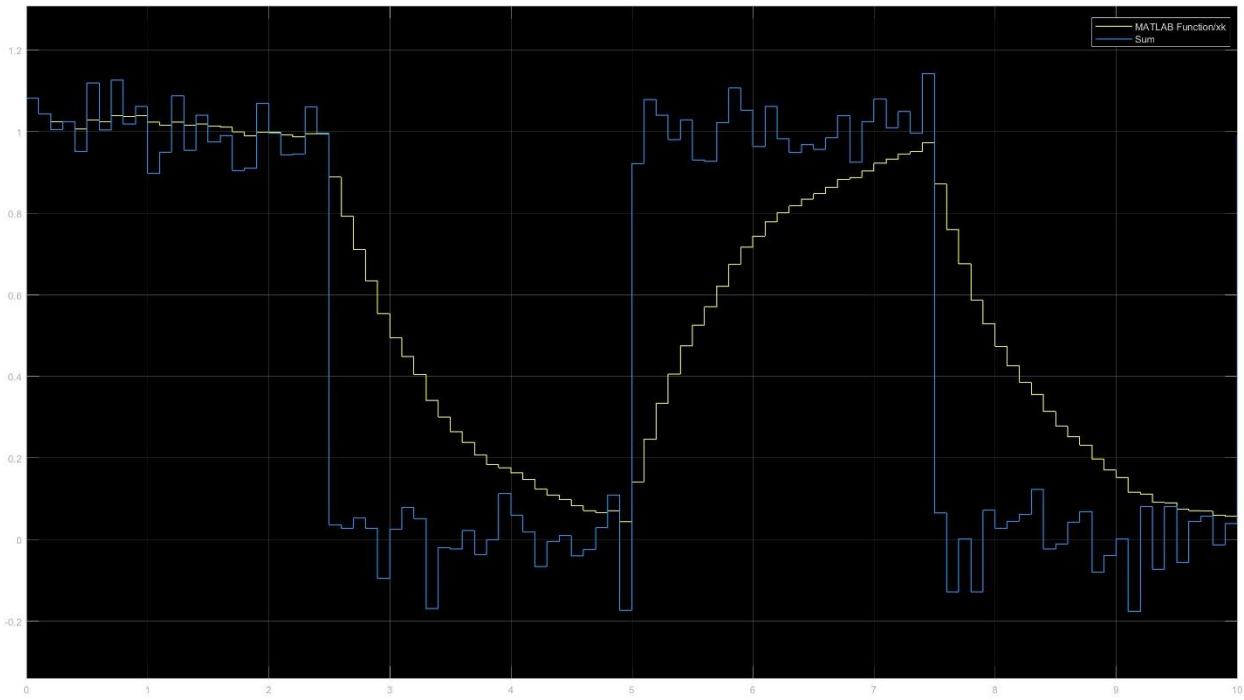
b)

MATLAB Code

When k =9

```
function [xk,k]= fcn(xkm1,z,k,zk)

  if z< 0.2
      k=1;
  else
      k=k+1;
  end

  if k>9
      k=9;
  end

  xk=xkm1+(1/(k))*(zk-xkm1);
```

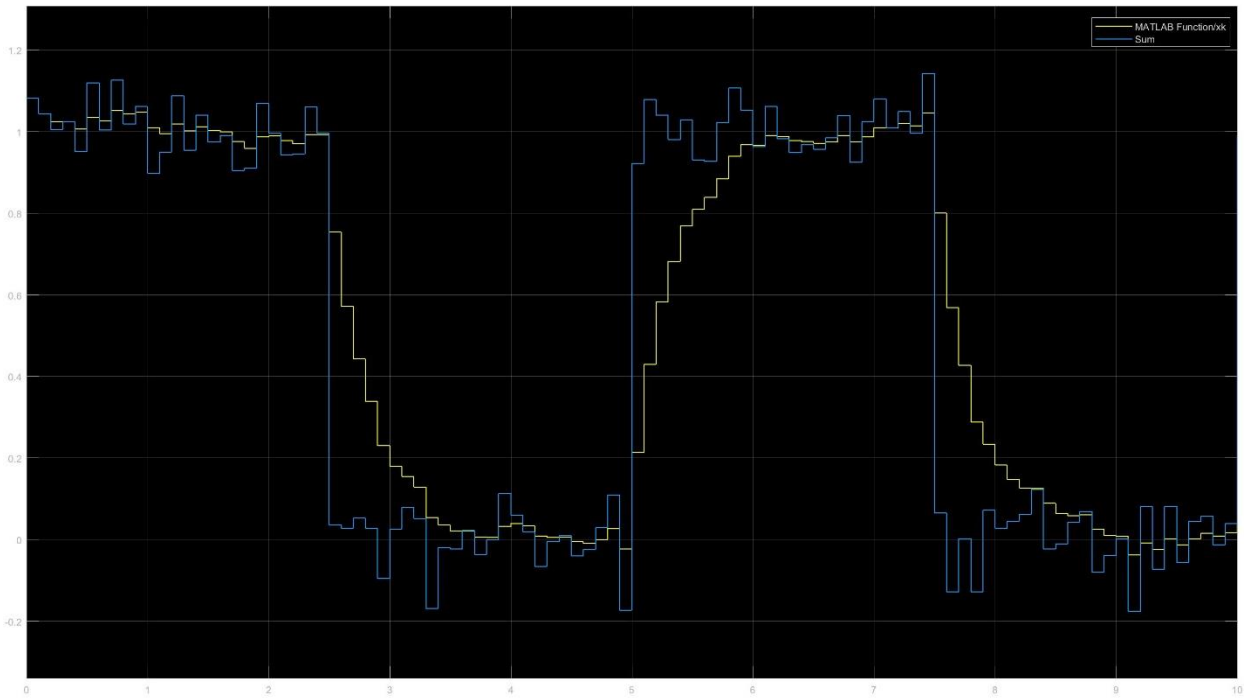
Response -



c) When k = 4

```
function [xk,k]= fcn(xkm1,z,k,zk)

  if z< 0.2
      k=1;
  else
      k=k+1;
  end

  if k>4
      k=4;
  end

  xk=xkm1+(1/(k))*(zk-xkm1);
```

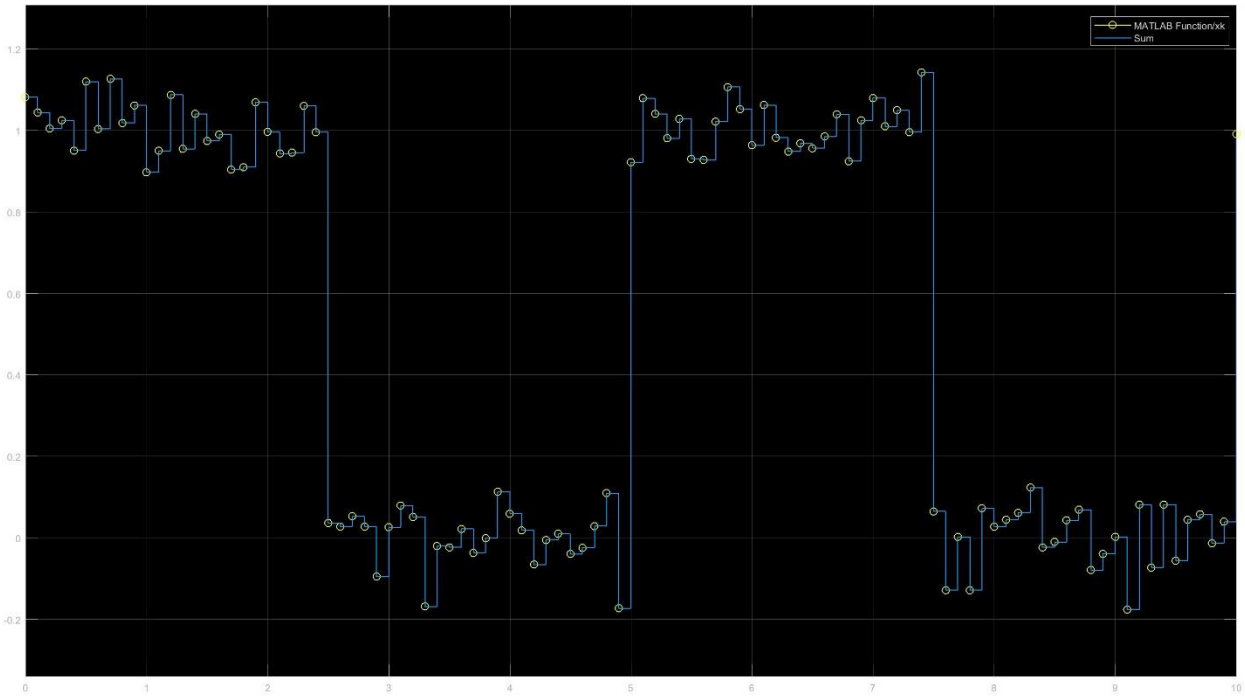
Response -



d) When k =1

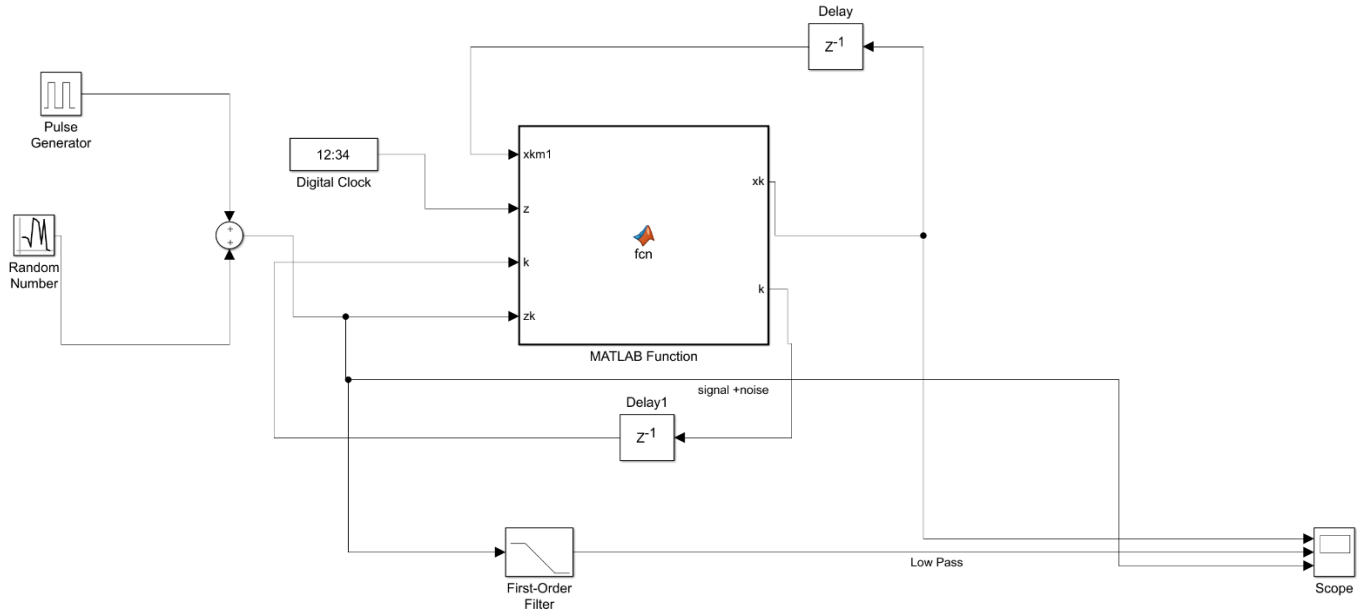
```
function [xk,k]= fcn(xkm1,z,k,zk)

  if z< 0.2
      k=1;
  else
      k=k+1;
  end

  if k>1
      k=1;
  end

  xk=xkm1+(1/(k))*(zk-xkm1);
```

Response -

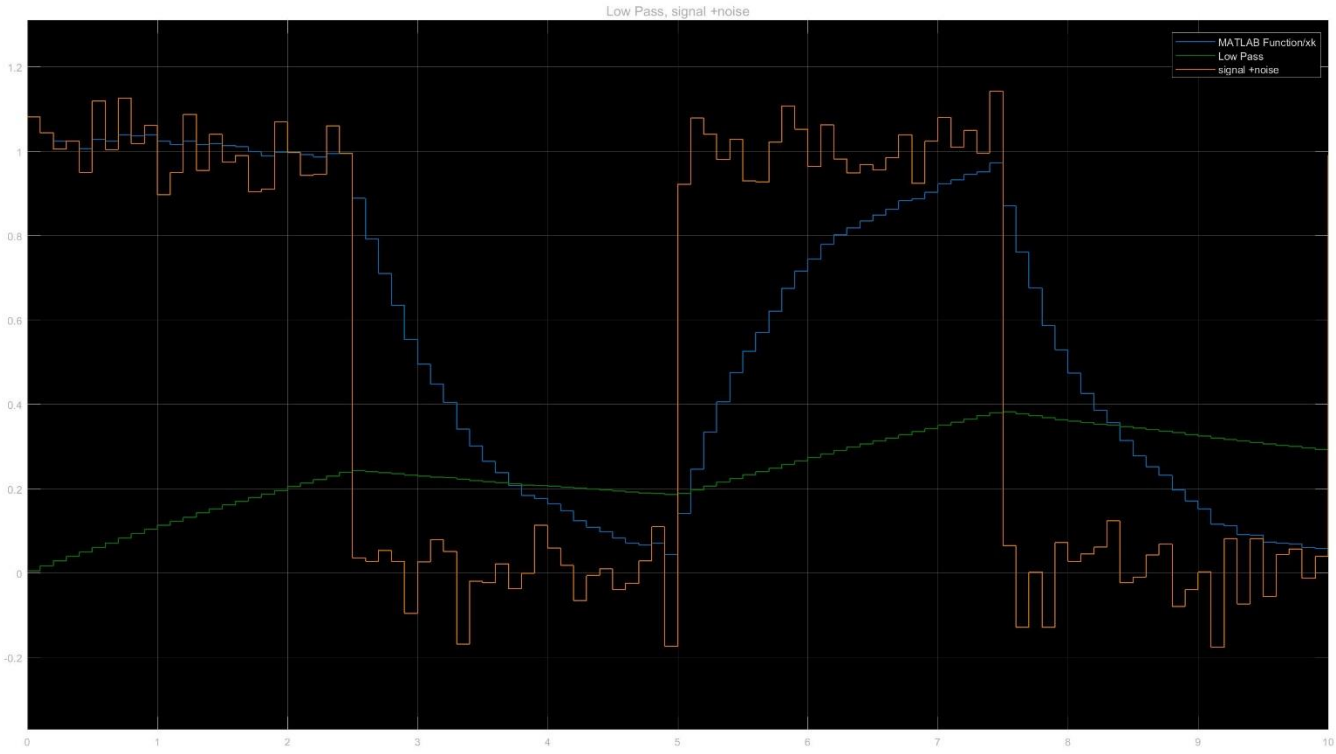


e) According to the above responses for different values of k, we can see that the estimator better predicts the incoming signal when we decrease the value of k. It approaches the original signal when the value of k =1.

f) Block Diagram



Response –


Low Pass, signal +noise
MATLAB Function/xk
Low Pass
signal +noise
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
0
1
2
3
4
5
6
7
8
9
10