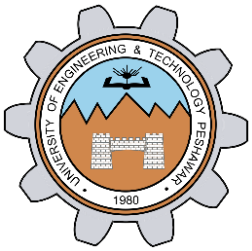
System Interconnections in Simulink

LAB # 03



Fall 2024

CSE-310L Control Systems Lab

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Registration No.: **21PWCSE2059**

Class Section: **C**

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

Submitted to:

Dr. Muniba Ashfaq

Date:

20th **October 2024**

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

Objectives:

The objective of this lab is to learn about:

- Series, Parallel and feedback interconnection of systems

Series System Interconnection:

Find the equivalent system of the following systems connected in series. Prove it using Simulink.

G1(s) = 1/(S+1)

G2(s) = 1/(s+4)

G3(s) = (s+3)/(s+5)

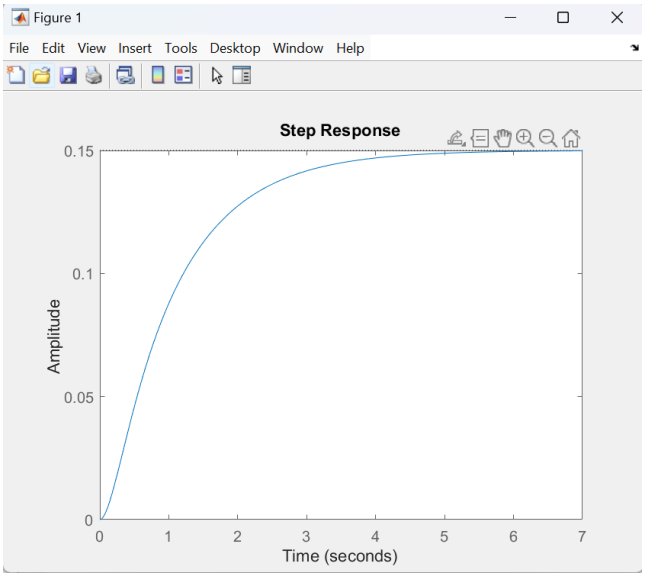
MATLAB:

Code:

Task1.m | Task.m

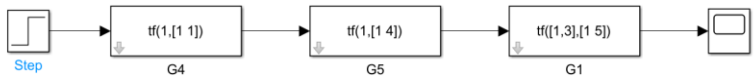
```
G1 = tf([1], ...
    [1,1]);
G2 = tf([1], ...
    [1,4]);
G3 = tf([1,3], ...
    [1,5]);

%Connect in series
G_mid_series = series(G1,G2);
series_out = series(G_mid_series, G3)
figure(1)
step(series_out)
```

Output:

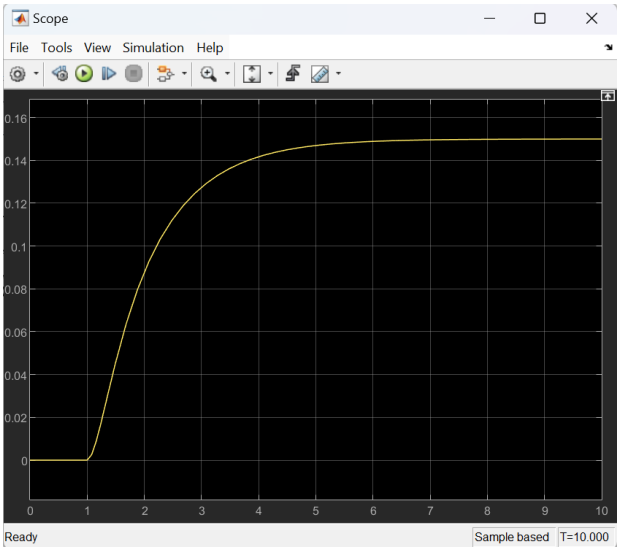


Simulink:

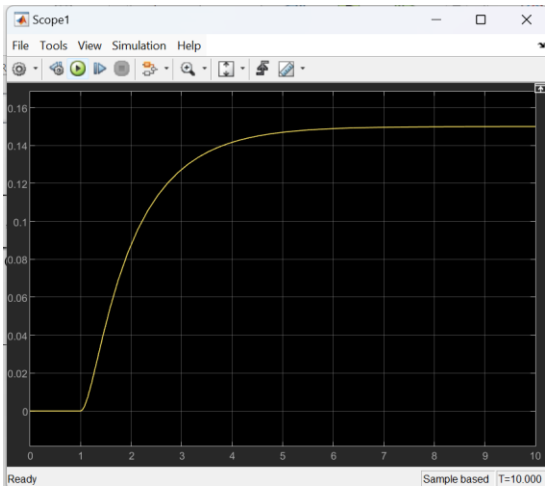
Block Design:



Output:



Equivalent System:



Parallel System Interconnection:

Find the equivalent system of the following systems connected in parallel. Prove it using Simulink.

G1(s) = 1/(S+1)

G2(s) = 1/(s+4)

G3(s) = (s+3)/(s+5)

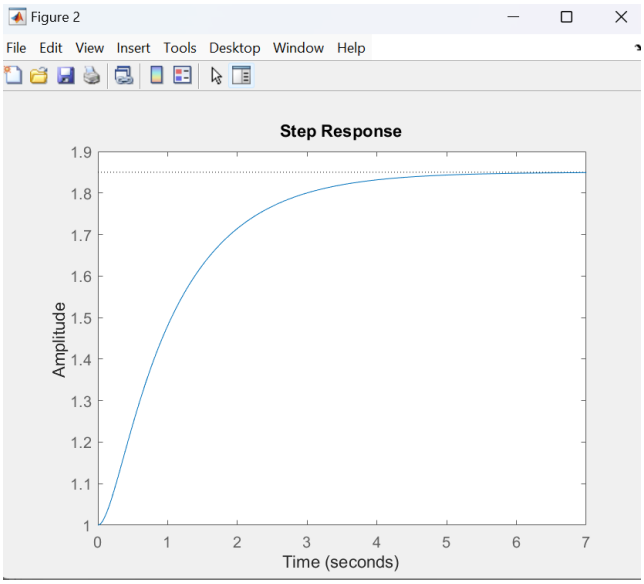
MATLAB:

Code:

Task1.m | Task.m

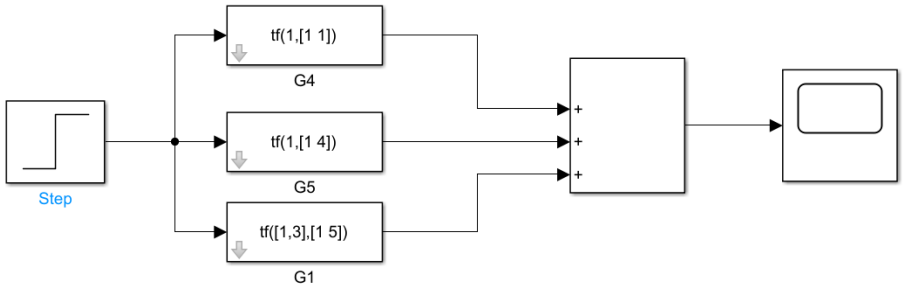
```
14  %Connect in parallel
15  G_mid_parallel = parallel(G1,G2);
16  parallel_out = parallel(G_mid_parallel, G3);
17
18  figure(2)
19  step(parallel_out)
```

Output:

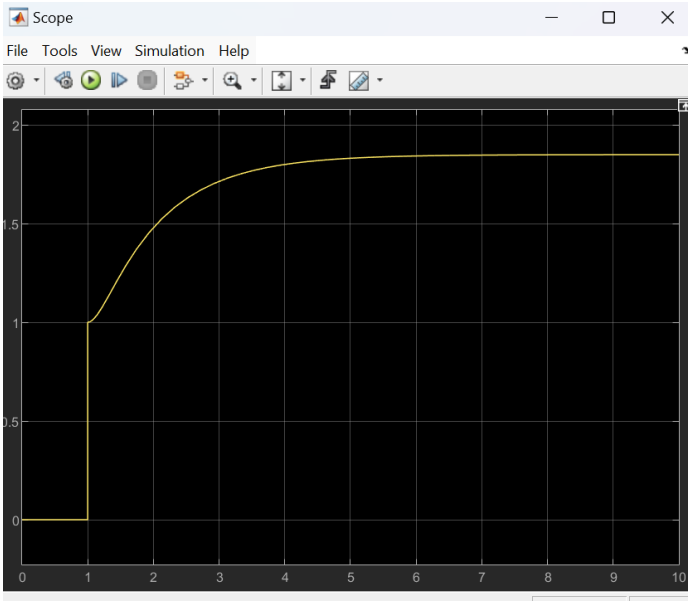


Simulink:

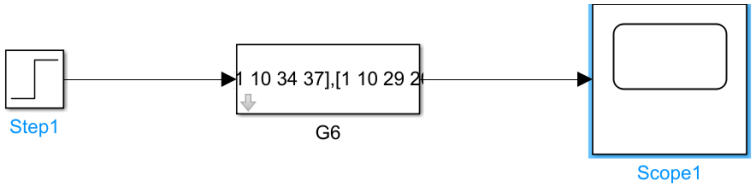
Block Design:

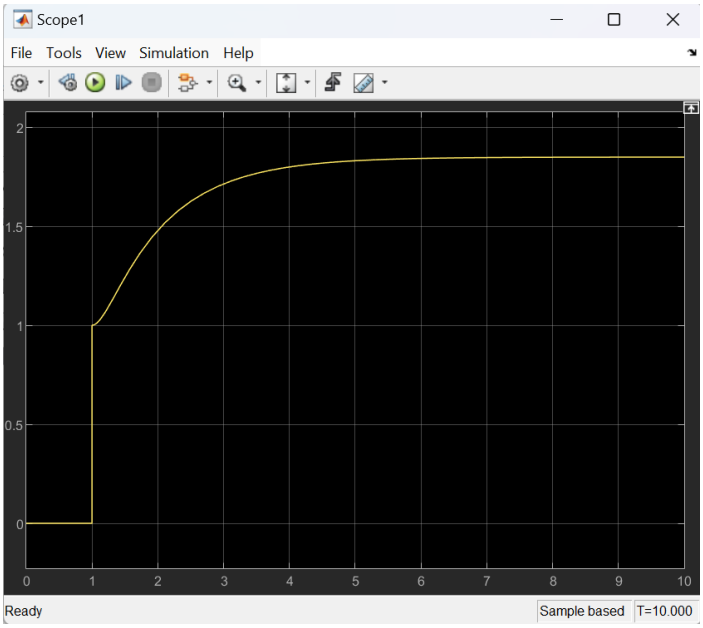


Output:



Equivalent System:





Negative feedback system interconnection:

MATLAB:

Code:

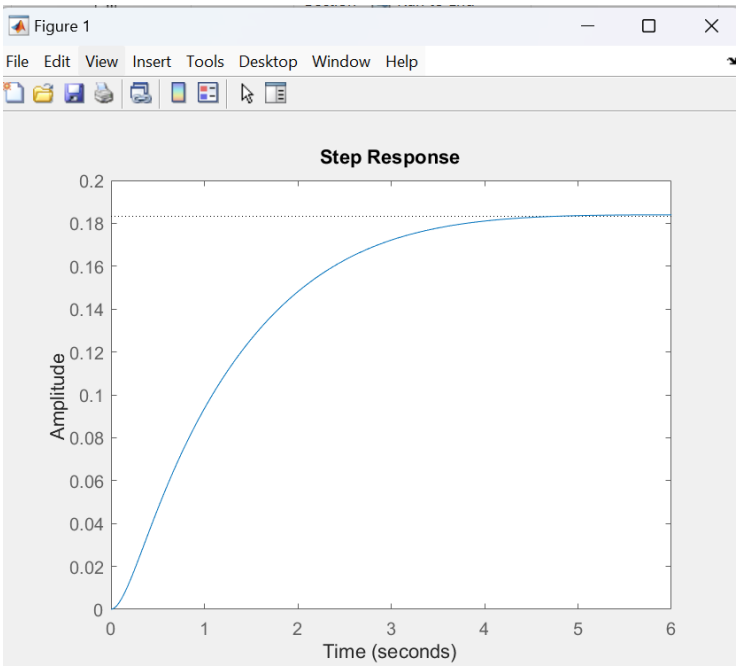
Task1.m | Task.m

```
G1 = tf([1], ...
    [1,1]);
G2 = tf([1], ...
    [1,4]);
G3 = tf([1,3], ...
    [1,5]);
G_mid_series = series(G1,G2);
A = parallel(G_mid_series, G3);
B = series(A,G_mid_series);
C=parallel(G1, G2);
D = series(C,G3);
out = feedback(B,D)
step(out)
```

Output:

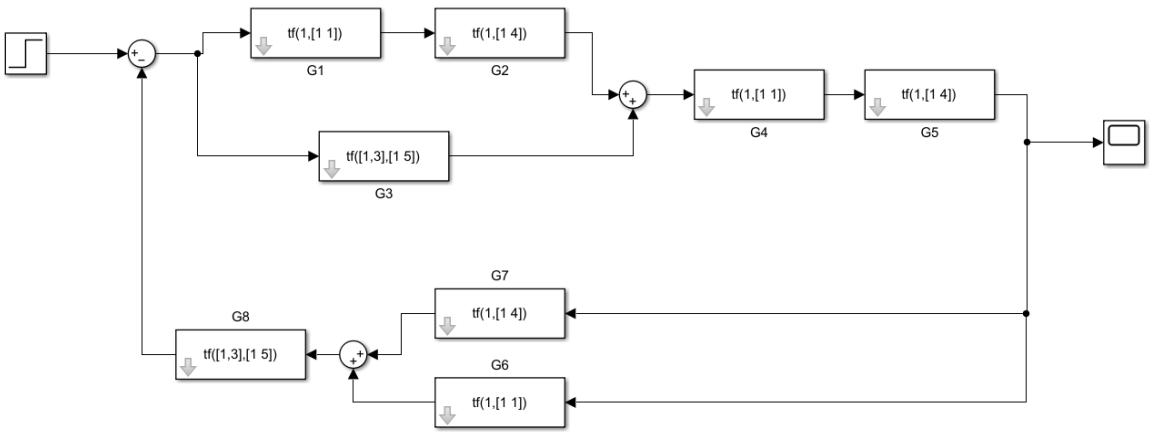
Command Window

```
              s^6 + 18 s^5 + 129 s^4 + 469 s^3 + 910 s^2 + 893 s + 340
  ------------------------------------------------------------------------------------
  s^8 + 25 s^7 + 262 s^6 + 1492 s^5 + 5000 s^4 + 9988 s^3 + 11538 s^2 + 7127 s + 1855

Continuous-time transfer function.
Model Properties
```

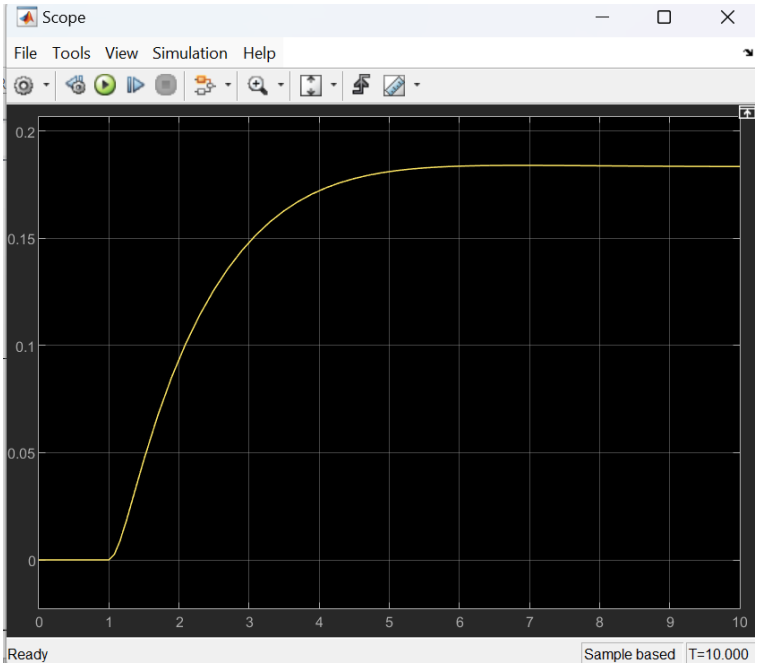


Simulink:

Block Design:



Output:



Equivalent System: