



Islamic University of
Gaza
Faculty of Engineering
Computer Engineering
Department



Linear Control System Lab

Experiment " 04 "

Experiment Name:

System Modeling By MATLAB & LabVIEW

Prepared by:

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Supervised by:

Prof. Nael Sofyan Dokhan

ID Number:

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Section:

106

Day of Exp. :

Tuesday

Date of Exp. :

24th, March, 2022

Hours:

12:00 pm – 2:00 pm

First Question (:

MATLAB:

```
%% Q01
%% Transfer function part:
num1 = 1;
den1 = [1 1];
G1 = tf(num1, den1);
num2 = 1;
den2 = [2 3];
G2 = tf(num2, den2);
G3 = parallel(G1, G2);
num3 = 1;
den3 = [1 2];
G4 = tf(num3, den3);
G5 = series(G3, G4);
G6 = feedback(G5, 1);
Transfer_Function = feedback(G6, -1)

%% State Space part:
num = [3 4];
den = [2 9 13 6];
[A,B,C,D]= tf2ss(num, den);
State_Space = ss(A,B,C,D)
```

```

1      %% Q01
2      %% Transfer function part:
3      num1 = 1;
4      den1 = [1 1];
5      G1 = tf(num1, den1);
6      num2 = 1;
7      den2 = [2 3];
8      G2 = tf(num2, den2);
9      G3 = parallel(G1, G2);
10     num3 = 1;
11     den3 = [1 2];
12     G4 = tf(num3, den3);
13     G5 = series(G3,G4);
14     G6 = feedback(G5,1);
15     Transfer_Function = feedback(G6,-1)
16
17     |

```

Command Window

>> untitled

Transfer_Function =

$$\frac{3s + 4}{2s^3 + 9s^2 + 13s + 6}$$

Continuous-time transfer function.

(Q1: Transfer Function by MATLAB)

```

1      %% Q01
2      %% State Space part:
3      num = [3 4];
4      den = [2 9 13 6];
5      [A,B,C,D]= tf2ss(num, den);
6      State Space = ss(A,B,C,D)

```

Command Window

```
>> untitled
```

```
State_Space =
```

```
A =
```

	x1	x2	x3
x1	-4.5	-6.5	-3
x2	1	0	0
x3	0	1	0

```
B =
```

	u1
x1	1
x2	0
x3	0

```
C =
```

	x1	x2	x3
y1	0	1.5	2

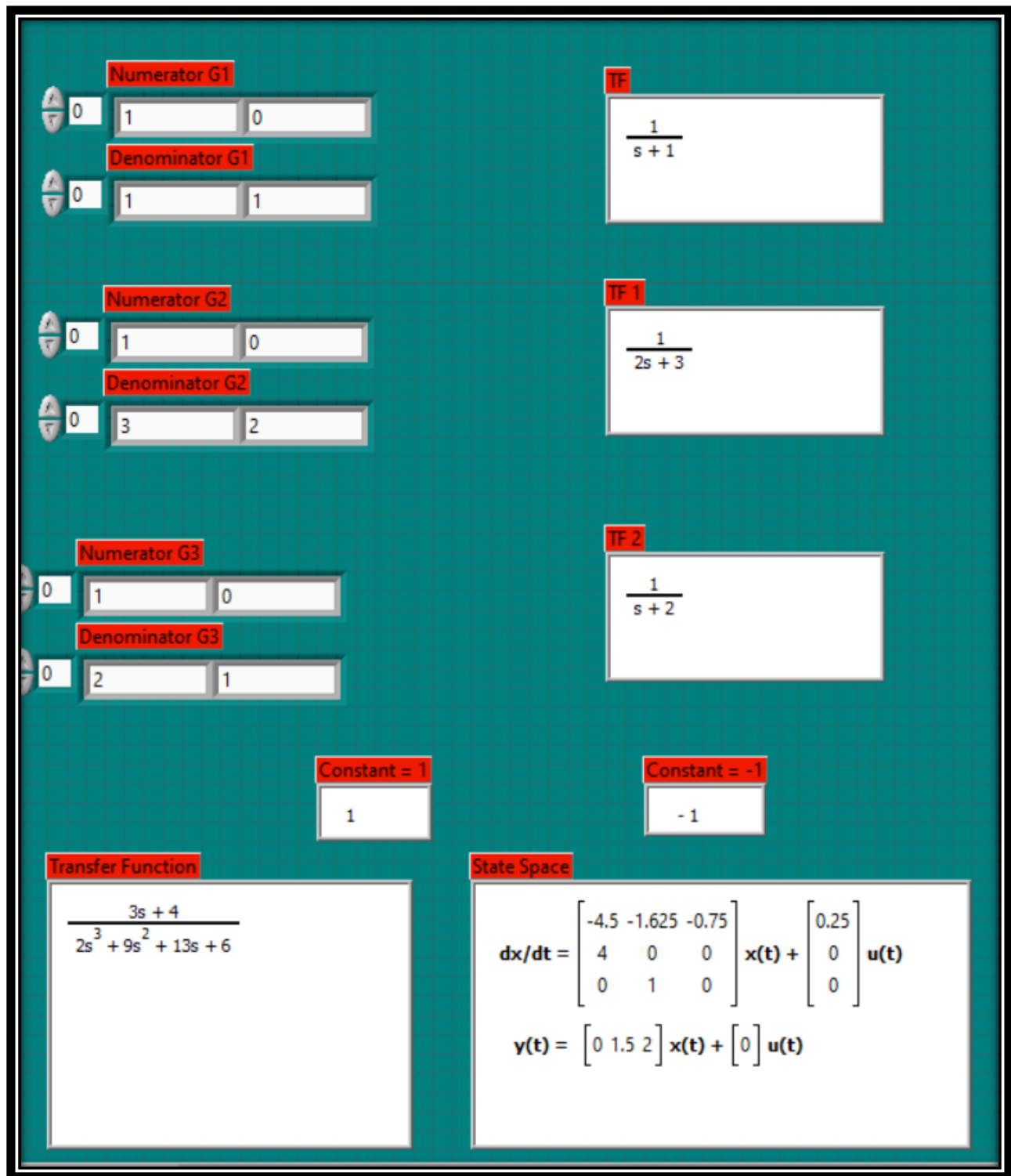
```
D =
```

	u1
y1	0

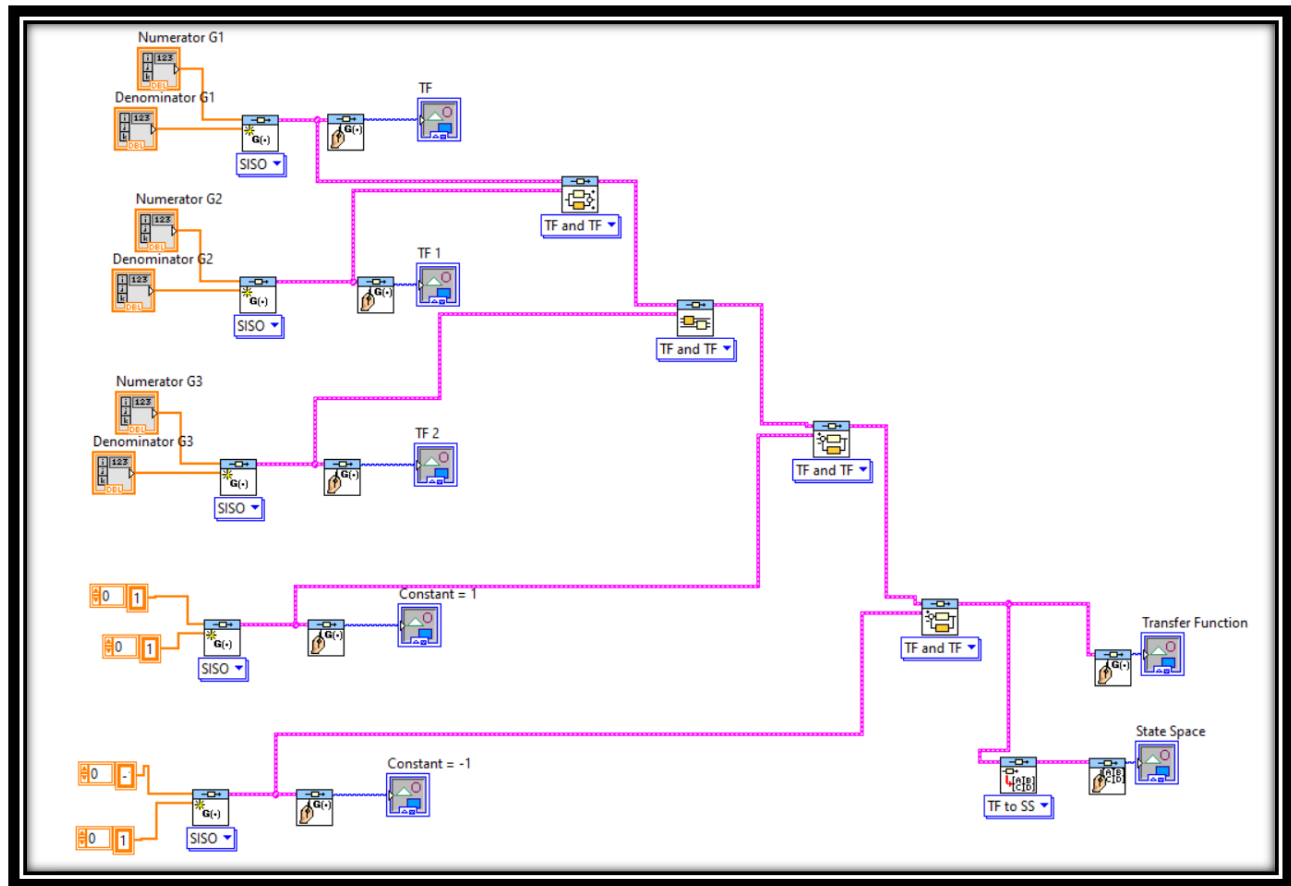
```
Continuous-time state-space model.
```

(Q1: State Space by MATLAB)

Front Panel:



Block Diagram:



Comments:

Explanation video =>

<https://www.youtube.com/watch?v=di26XUs7SIQ>

LabView File =>

https://drive.google.com/file/d/17BMrDWFSYK30Z_esFPJ0qgwrstdMs9UQX/view?usp=sharing

Second Question (:

MATLAB:

```
%% Q02
%% Transfer function part:
num1 = [1 0];
den1 = [1 5 9];
G1 = tf (num1, den1);
num2 = 1;
den2 = [1 0];
G2 = tf (num2, den2);
G3 = parallel (G1, G2);
G4 = feedback (G3, 1);
G5 = series (G4, G2);
Transfer_Function = feedback (G5,1);

%% State Space part:
num = [2 5 9];
den = [1 7 16 14 9];
[a, b, c, d] = tf2ss(num, den);
State_Space = ss(a,b,c,d)
```

```

1      %% Q02
2      %% Transfer function part:
3      num1 = [1 0];
4      den1 = [1 5 9];
5      G1 = tf (num1, den1);
6      num2 = 1;
7      den2 = [1 0];
8      G2 = tf (num2, den2);
9      G3 = parallel (G1, G2);
10     G4 = feedback (G3, 1);
11     G5 = series (G4, G2);
12     Transfer_Function = feedback (G5,1)
13

```

Command Window

```
>> untitled
```

```
Transfer_Function =
```

$$\frac{2s^2 + 5s + 9}{s^4 + 7s^3 + 16s^2 + 14s + 9}$$

Continuous-time transfer function.

(Q2: Transfer Function by MATLAB)

```
1 %% Q02
2 %% State Space part:
3 num = [2 5 9];
4 den = [1 7 16 14 9];
5 [a ,b ,c, d]= tf2ss(num, den);
6 State_Space = ss(a,b,c,d)
```

Command Window

```
>> untitled

State_Space =

A =
      x1      x2      x3      x4
x1    -7   -16   -14    -9
x2     1     0     0     0
x3     0     1     0     0
x4     0     0     1     0

B =
      u1
x1     1
x2     0
x3     0
x4     0

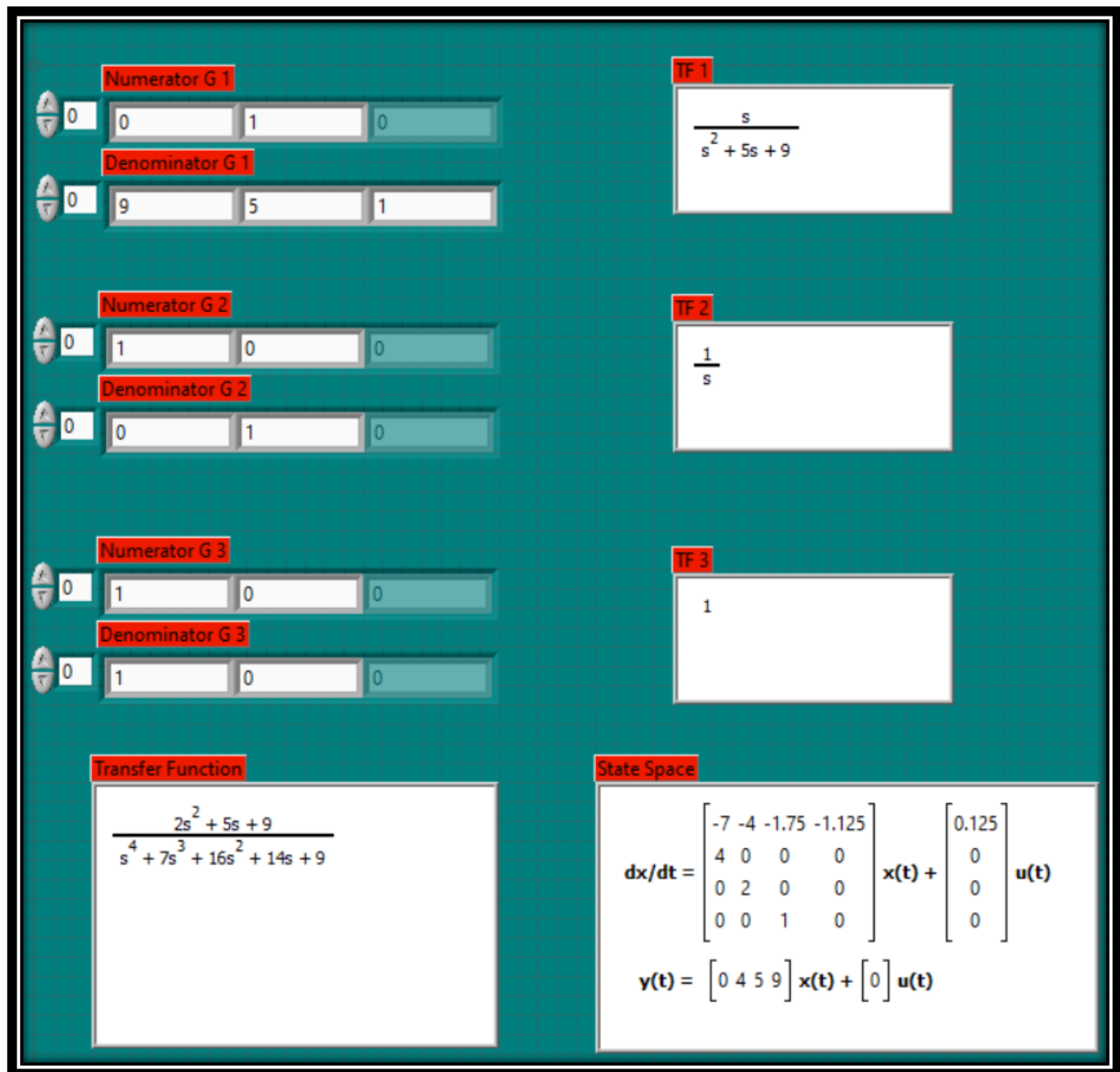
C =
      x1      x2      x3      x4
y1     0     2     5     9

D =
      u1
y1     0

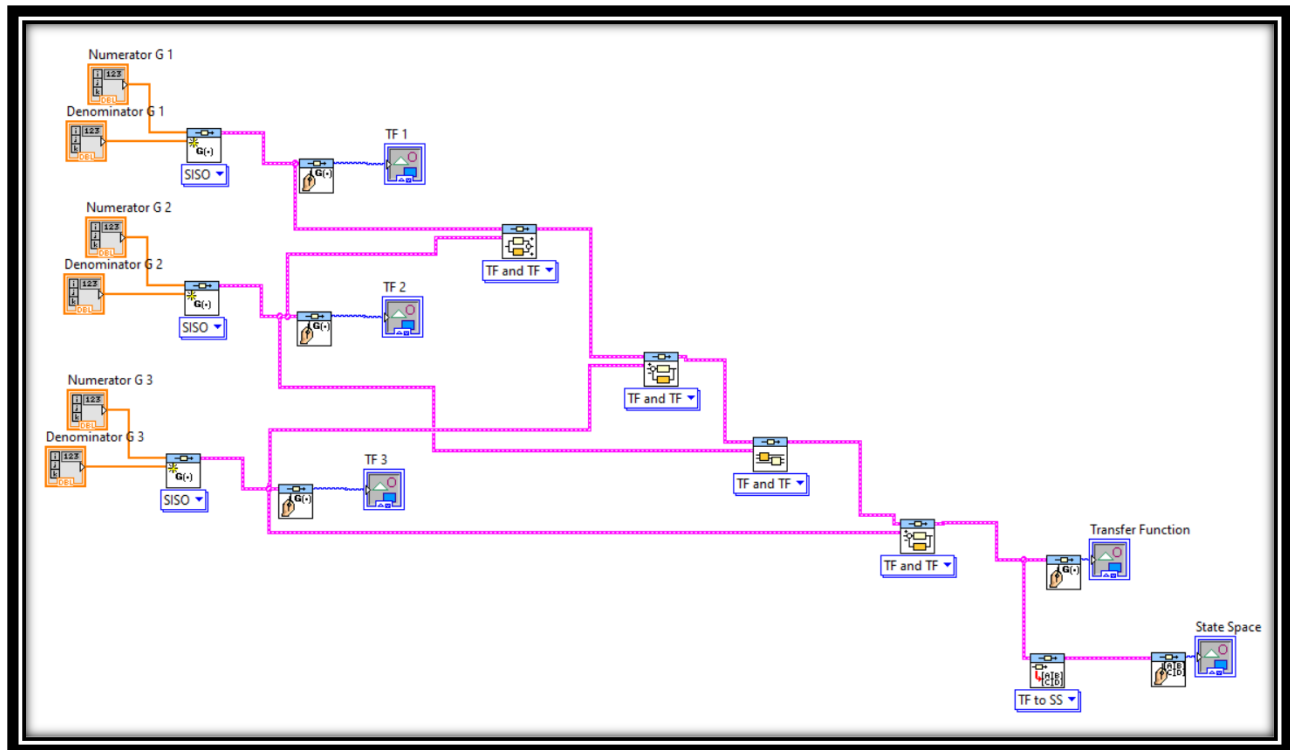
Continuous-time state-space model.
```

(Q2: State Space by MATLAB)

Front Panel:



Block Diagram:



Comments:

Explanation video =>

<https://www.youtube.com/watch?v=z8Jyho08HbY>

LabView File =>

https://drive.google.com/file/d/1H1wBI9OyqLylLs_xhHRQ9c9R8iH_v0H2/view?usp=sharing

The End