



Islamic University of
Gaza
Faculty of Engineering
Computer Engineering
Department



Linear Control System Lab

Experiment " 05 "

Experiment Name:

Time Response Analysis

Prepared by:

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Section:

106

Day of Exp. :

Tuesday

Date of Exp. :

12th, April, 2022

Hours:

12:00 pm – 2:00 pm

Question 1)

```
1 %% Q(01)_1a
2 num = 2;
3 den = [1 0 1];
4 G = tf(num, den)
5 pole(G)
6
```

Command Window

G =

$$\frac{2}{s^2 + 1}$$

Continuous-time transfer function.

ans =

```
0.0000 + 1.0000i
0.0000 - 1.0000i
```

```
1 %% Q(01)_1b
2 num = 2;
3 den = [1 0.2 1];
4 G = tf(num, den)
5 pole(G)
6
7
```

Command Window

G =

$$\frac{2}{s^2 + 0.2 s + 1}$$

Continuous-time transfer function.

ans =

```
-0.1000 + 0.9950i
-0.1000 - 0.9950i
```

```

1 %% Q(01)_1c
2 num = 2;
3 den = [1 1.4 1];
4 G = tf (num, den)
5 pole(G)
6
7

```

Command Window

G =

$$\frac{2}{s^2 + 1.4 s + 1}$$

Continuous-time transfer function.

ans =

```

-0.7000 + 0.7141i
-0.7000 - 0.7141i

```

```
1 %% Q(01)_1d
2 num = 2;
3 den = [1 2 1];
4 G = tf(num, den)
5 pole(G)
6
7
```

Command Window

G =

$$\frac{2}{s^2 + 2s + 1}$$

Continuous-time transfer function.

ans =

-1
-1

```

1 %% Q(01)_1e
2 num = 2;
3 den = [1 10 1];
4 G = tf(num, den)
5 pole(G)
6
7

```

Command Window

```

G =

      2
-----
s^2 + 10 s + 1

Continuous-time transfer function.

ans =

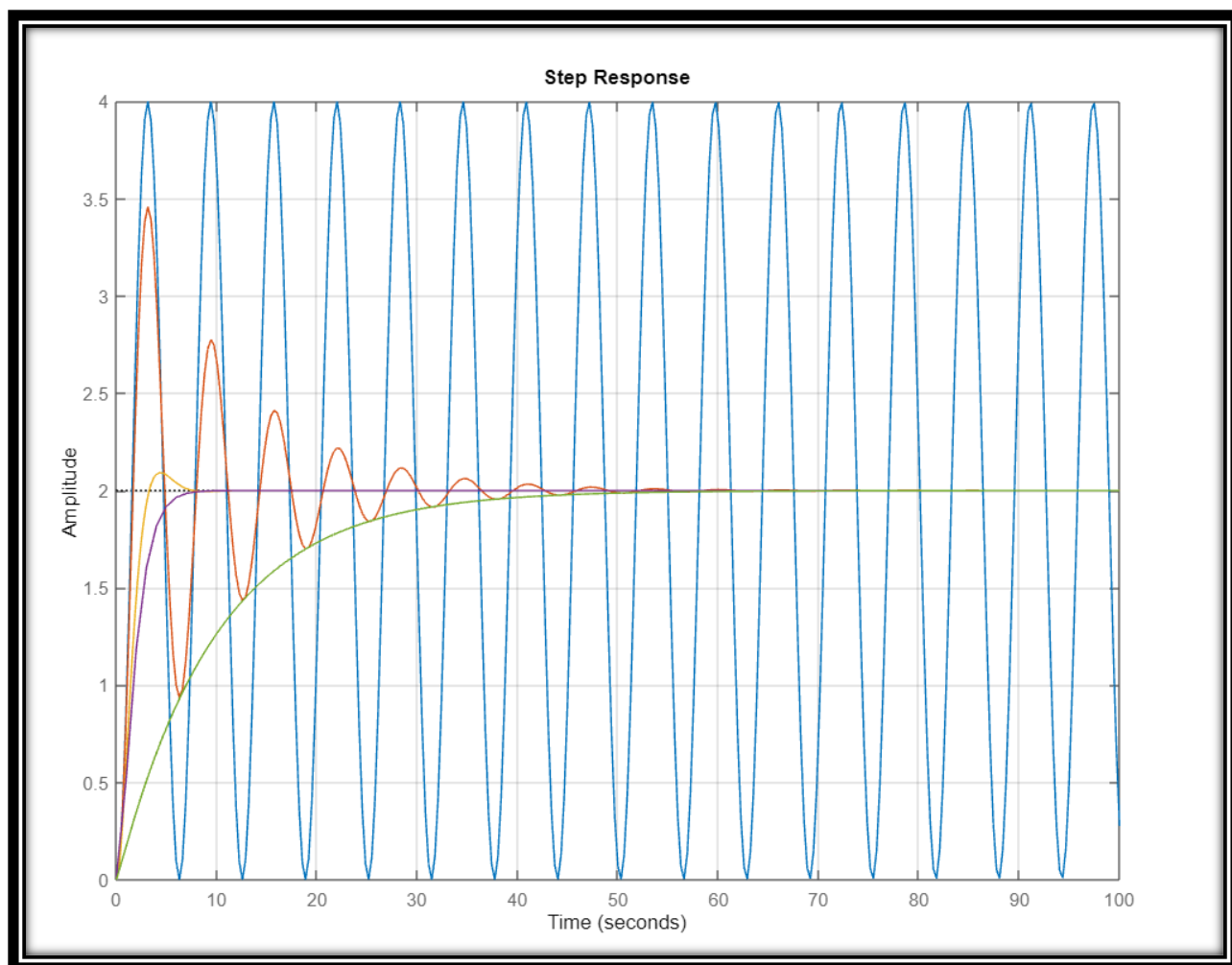
-9.8990
-0.1010

```

```

1 %% Q(01)_2
2
3 G1 = tf([2],[1 0 1]);
4 G2 = tf([2],[1 0.2 1]);
5 G3 = tf([2],[1 1.4 1]);
6 G4 = tf([2],[1 2 1]);
7 G5 = tf([2],[1 10 1]);
8 step(G1,G2,G3,G4,G5,100);
9 grid; datacursormode.Enable = 'on';

```



```

1 %% Q01_2a
2 num =2;
3 den = [1 0 1];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G, 100);
7 grid; datacursormode.Enable = 'on';
8

```

Command Window

G =

$$\frac{2}{s^2 + 1}$$

Continuous-time transfer function.

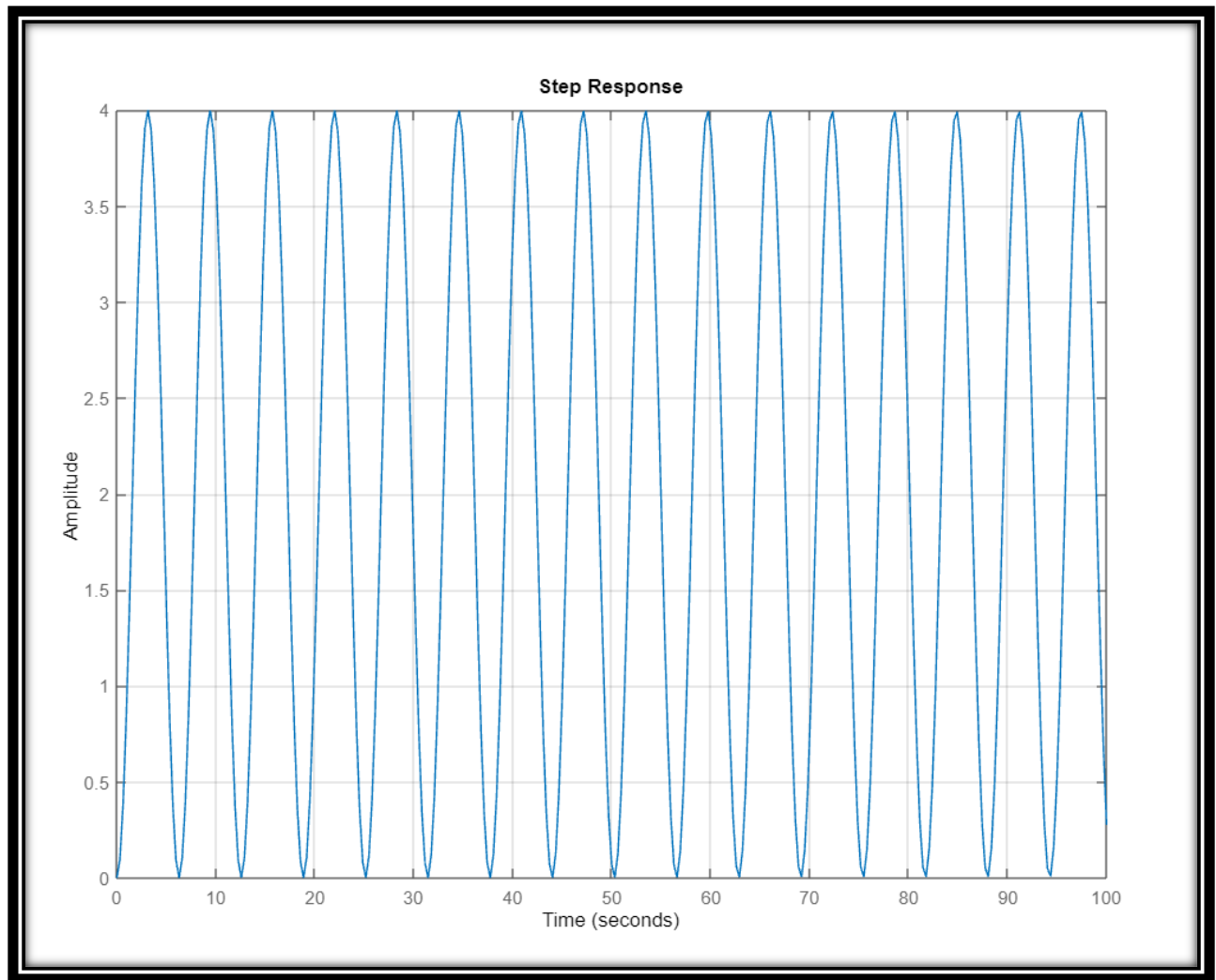
ans =

struct with fields:

```

    RiseTime: NaN
TransientTime: NaN
SettlingTime: NaN
SettlingMin: NaN
SettlingMax: NaN
    Overshoot: NaN
Undershoot: NaN
        Peak: Inf
    PeakTime: Inf

```



```

1 %% Q01_2b
2 num =2;
3 den = [1 0.2 1];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G, 100);
7 grid; datacursormode.Enable = 'on';
8

```

Command Window

G =

$$\frac{2}{s^2 + 0.2 s + 1}$$

Continuous-time transfer function.

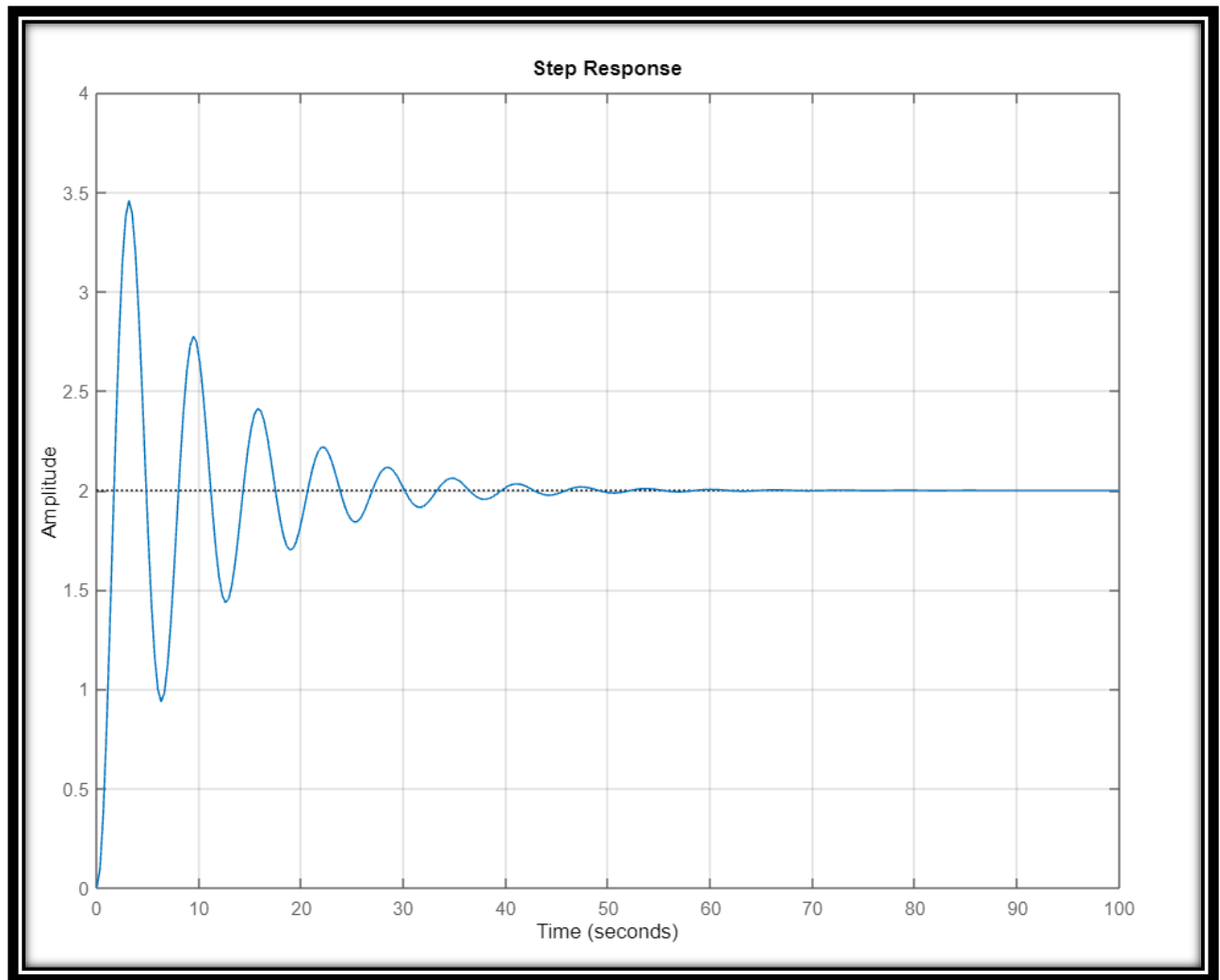
ans =

struct with fields:

```

    RiseTime: 1.1272
TransientTime: 38.3730
SettlingTime: 38.3730
SettlingMin: 0.9369
SettlingMax: 3.4583
    Overshoot: 72.9156
    Undershoot: 0
          Peak: 3.4583
    PeakTime: 3.1416

```



```

1 %% Q01_2c
2 num =2;
3 den = [1 1.4 1];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G, 100);
7 grid; datacursormode.Enable = 'on';
8

```

Command Window

```

G =

      2
-----
s^2 + 1.4 s + 1

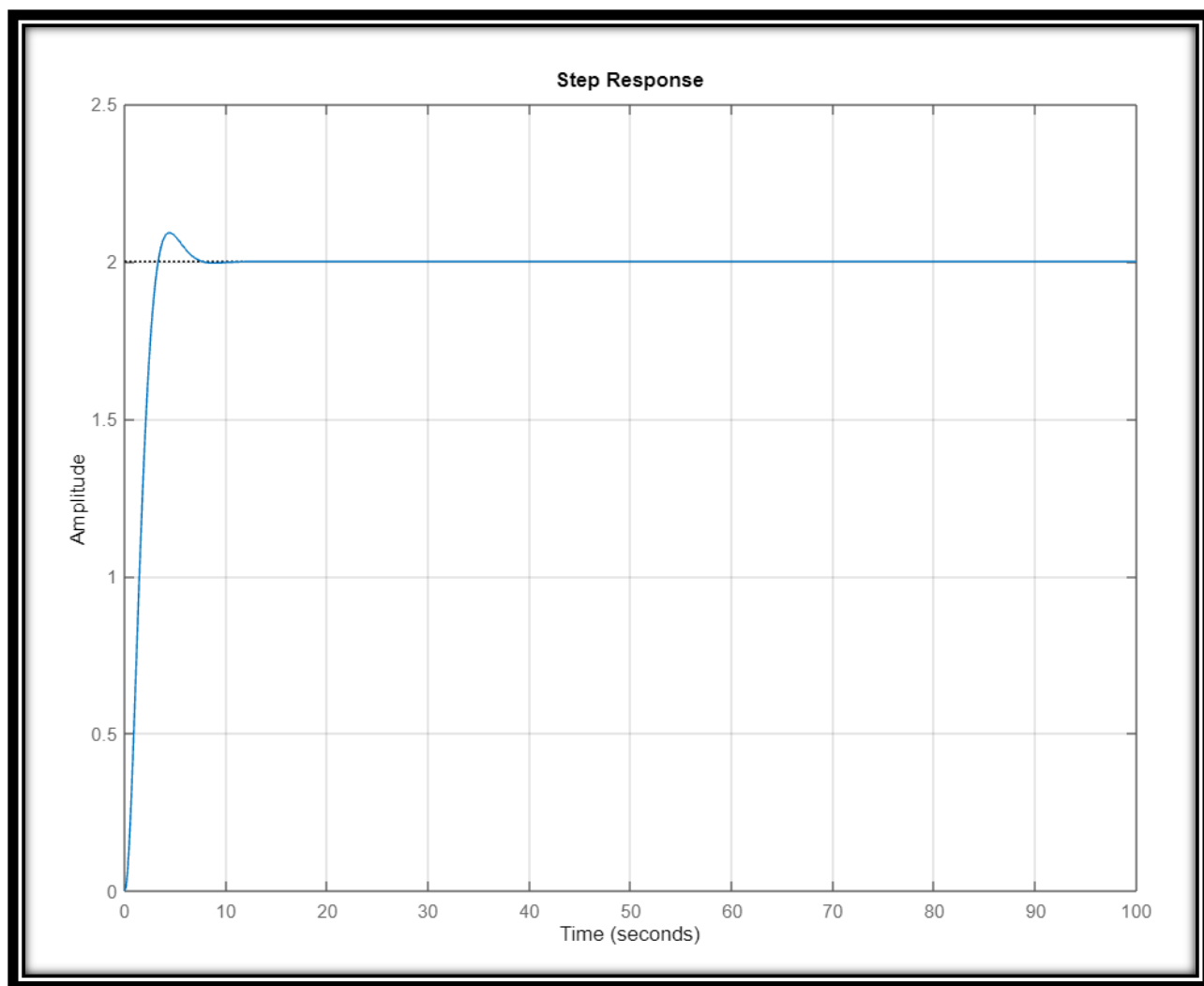
Continuous-time transfer function.

ans =

struct with fields:

    RiseTime: 2.1268
TransientTime: 5.9789
SettlingTime: 5.9789
SettlingMin: 1.8002
SettlingMax: 2.0920
Overshoot: 4.5986
Undershoot: 0
    Peak: 2.0920
    PeakTime: 4.4078

```



```

1 %% Q01_2d
2 num =2;
3 den = [1 2 1];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G, 100);
7 grid; datacursormode.Enable = 'on';
8

```

Command Window

G =

$$\frac{2}{s^2 + 2s + 1}$$

Continuous-time transfer function.

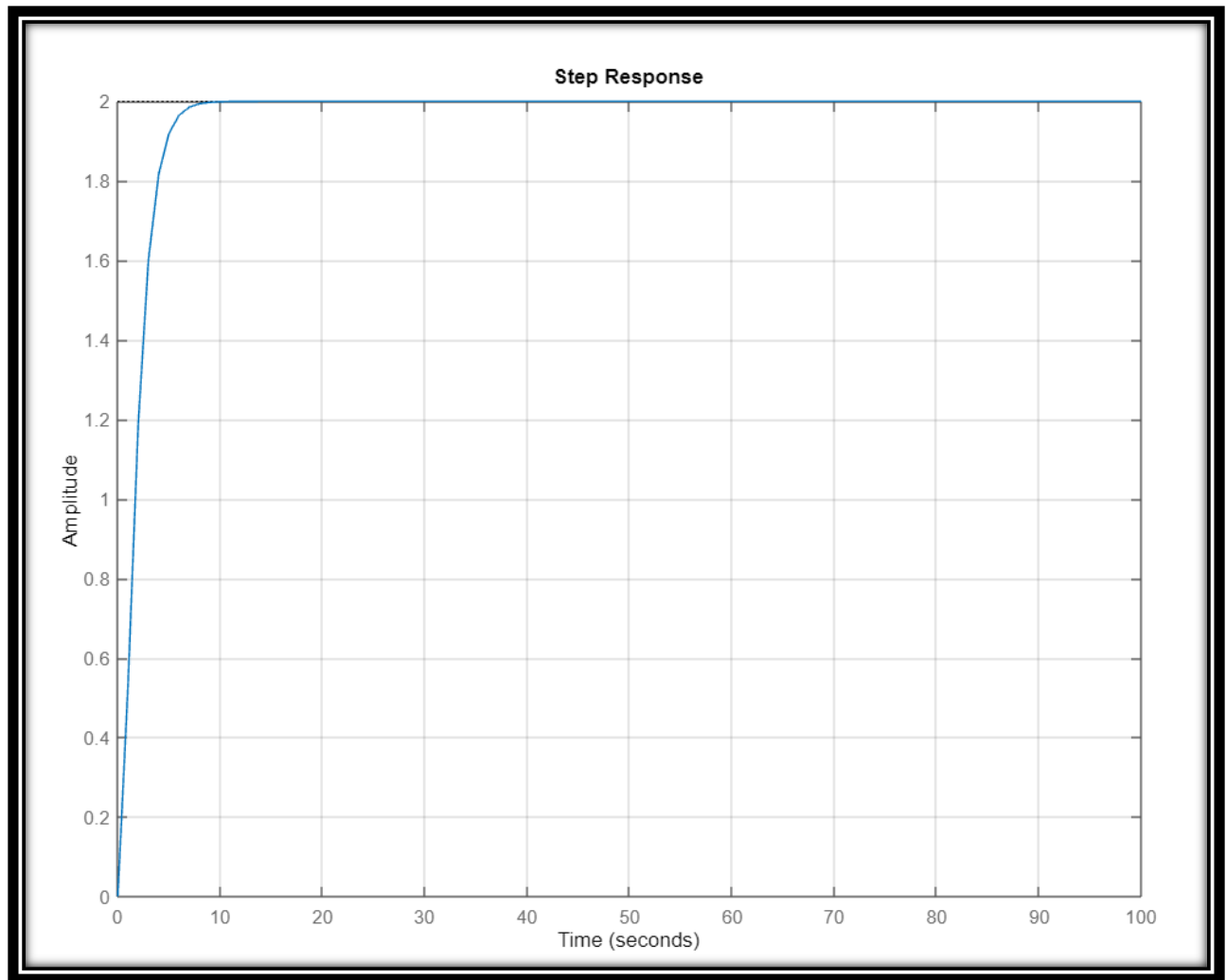
ans =

struct with fields:

```

    RiseTime: 3.3579
TransientTime: 5.8339
SettlingTime: 5.8339
SettlingMin: 1.8000
SettlingMax: 1.9988
    Overshoot: 0
    Undershoot: 0
        Peak: 1.9988
    PeakTime: 9.7900

```



```

1 %% Q01_2e
2 num =2;
3 den = [1 10 1];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G, 100);
7 grid; datacursormode.Enable = 'on';
8

```

Command Window

G =

$$\frac{2}{s^2 + 10s + 1}$$

Continuous-time transfer function.

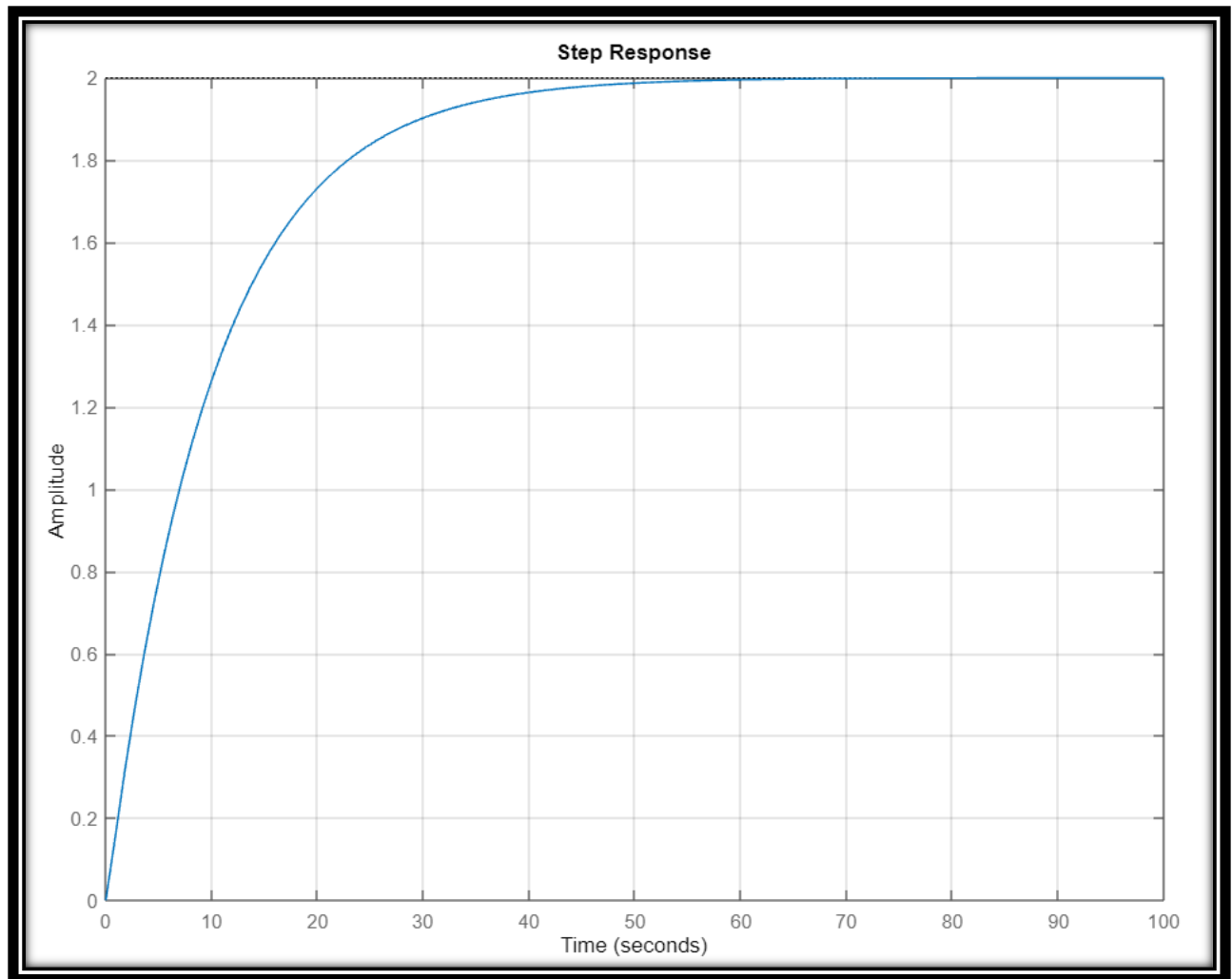
ans =

struct with fields:

```

    RiseTime: 21.7495
TransientTime: 38.8281
SettlingTime: 38.8281
SettlingMin: 1.8070
SettlingMax: 1.9999
Overshoot: 0
Undershoot: 0
    Peak: 1.9999
    PeakTime: 104.3931

```



```

1 %% Q01_3
2 num =2;
3 den = [1 1.6 1];
4 G = tf(num, den)
5 stepinfo(G)
6 [y, s] = step(G);
7 S_S_E = abs(1- y(end))
8 DC_gain =dcgain(G)
9 step(G);
10 grid; datacursormode.Enable = 'on';

```

Command Window

G =

$$\frac{2}{s^2 + 1.6 s + 1}$$

Continuous-time transfer function.

ans =

struct with fields:

```

    RiseTime: 2.4679
TransientTime: 3.7562
SettlingTime: 3.7562
SettlingMin: 1.8037
SettlingMax: 2.0303
    Overshoot: 1.5165
    Undershoot: 0
          Peak: 2.0303
    PeakTime: 5.2384

```

S_S_E =

1.0017

```

1 %% Q01_3
2 num =2;
3 den = [1 1.6 1];
4 G = tf(num, den)
5 stepinfo(G)
6 [y, s] = step(G);
7 S_S_E = abs(1- y(end))
8 DC_gain =dcgain(G)
9 step(G);
10 grid; datacursormode.Enable = 'on';

```

Command Window

Continuous-time transfer function.

ans =

struct with fields:

```

    RiseTime: 2.4679
TransientTime: 3.7562
SettlingTime: 3.7562
SettlingMin: 1.8037
SettlingMax: 2.0303
Overshoot: 1.5165
Undershoot: 0
    Peak: 2.0303
    PeakTime: 5.2384

```

S_S_E =

```

    1.0017

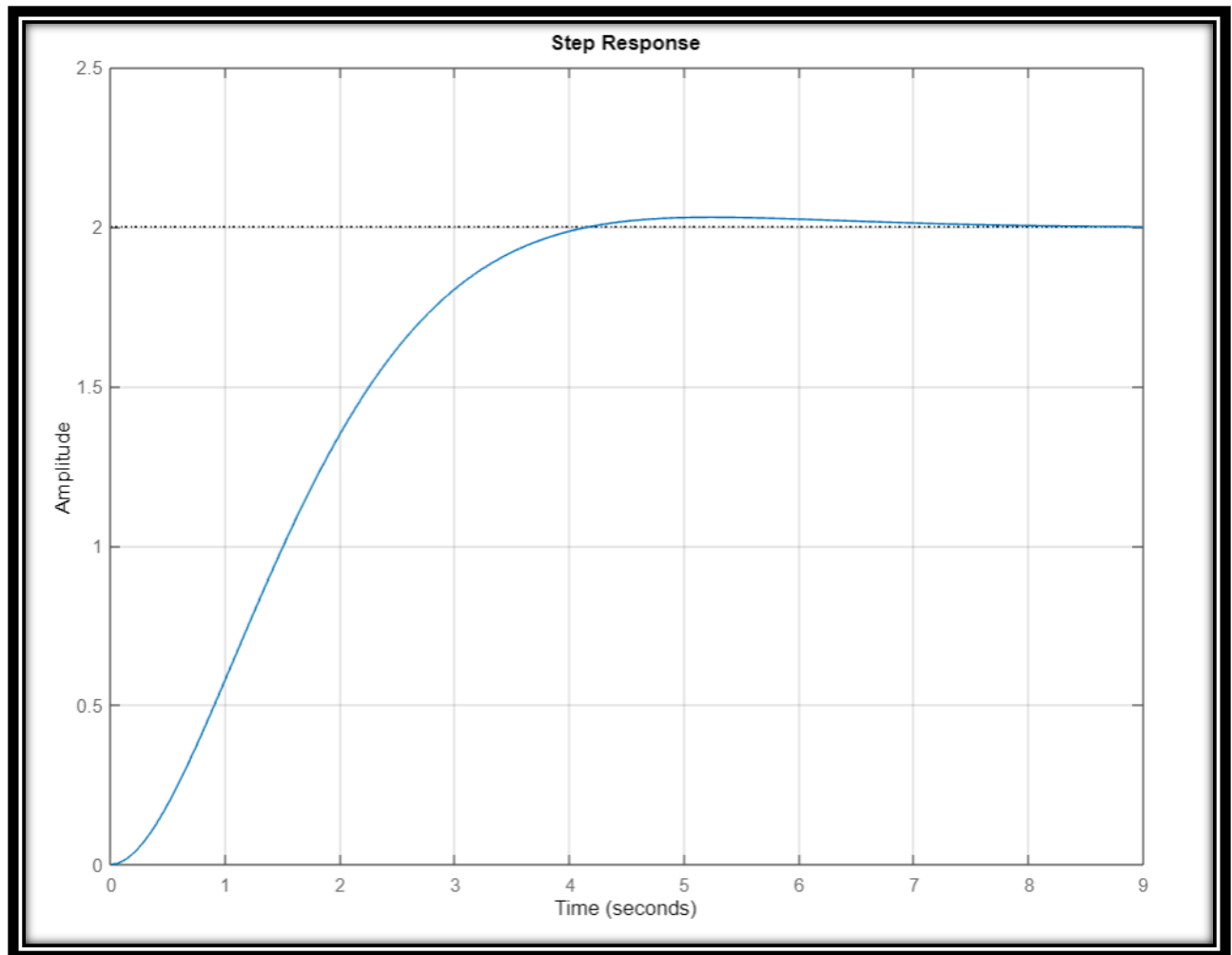
```

DC_gain =

```

    2

```



Question 2)

```
1 %% Q02
2 num = [2.8615];
3 den = [1 2 2.8615];
4 G = tf(num, den)
5 stepinfo(G)
6 step(G);
7 grid; datacursormode.Enable = 'on';
8
```

Command Window

G =

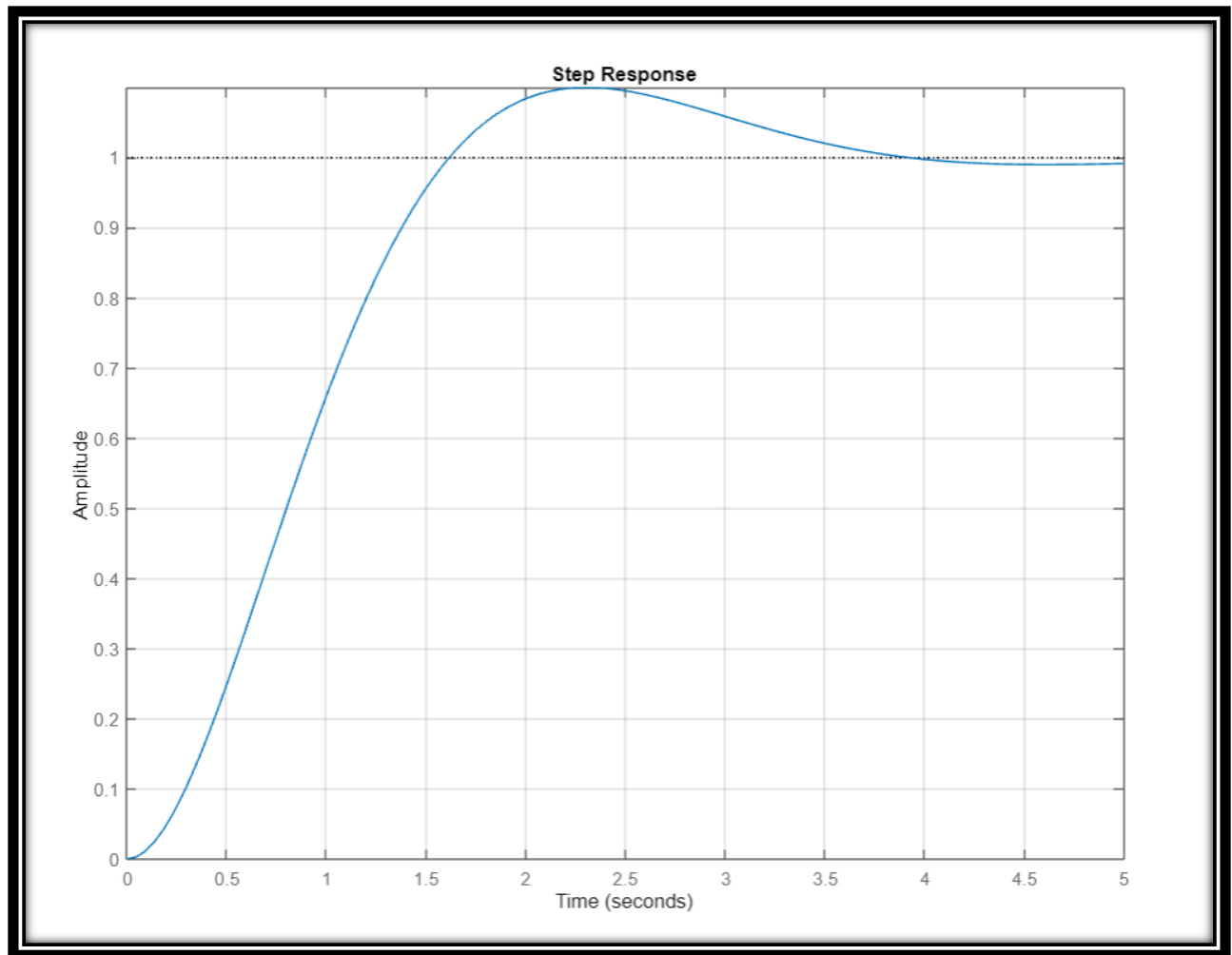
$$\frac{2.861}{s^2 + 2s + 2.861}$$

Continuous-time transfer function.

ans =

struct with fields:

- RiseTime: 1.0842
- TransientTime: 3.5031
- SettlingTime: 3.5031
- SettlingMin: 0.9025
- SettlingMax: 1.1000
- Overshoot: 9.9999
- Undershoot: 0
- Peak: 1.1000
- PeakTime: 2.3026



The End