

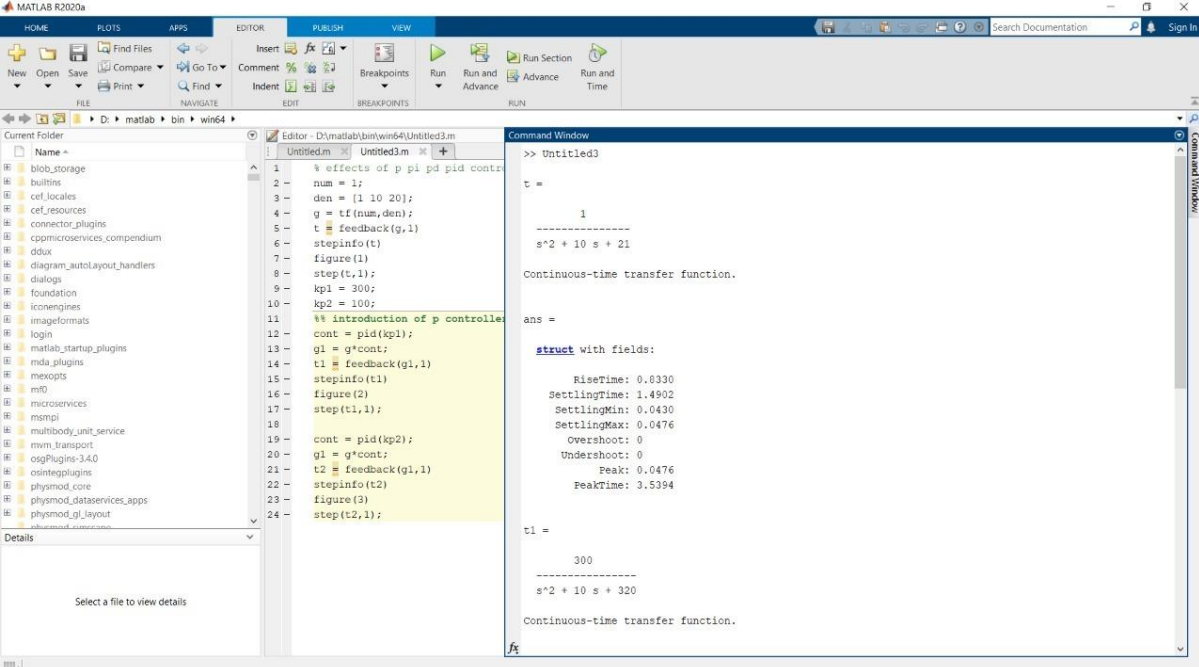
BATCH

Experiment no 4:

Study the Effect of P,PI,PD&PID Controller on the Step Response of Feedback Control system

Observation:

$K_p=1, k_i=0, k_d=0$



```
1 % effects of p pi pd pid contr
2 num = 1;
3 den = [1 10 20];
4 g = tf(num,den);
5 t = feedback(g,1)
6 stepinfo(t)
7 figure(1)
8 step(t,1);
9 kp1 = 300;
10 kp2 = 100;
11 %% introduction of p controller
12 cont = pid(kp1);
13 g1 = g*cont;
14 t1 = feedback(g1,1)
15 stepinfo(t1)
16 figure(2)
17 step(t1,1);
18
19 cont = pid(kp2);
20 g1 = g*cont;
21 t2 = feedback(g1,1)
22 stepinfo(t2)
23 figure(3)
24 step(t2,1);
```

Command Window

```
>> Untitled3
t =
-----
1
s^2 + 10 s + 21
Continuous-time transfer function.

ans =
struct with fields:
    RiseTime: 0.8330
    SettlingTime: 1.4902
    SettlingMin: 0.0430
    SettlingMax: 0.0476
    Overshoot: 0
    Undershoot: 0
    Peak: 0.0476
    PeakTime: 3.5394

t1 =
-----
300
s^2 + 10 s + 320
Continuous-time transfer function.
```

P-Controller

$k_p=100, k_i=0, k_d=0$

```
1 % effects of p pi pd pid contr
2 num = 1;
3 den = [1 10 20];
4 g = tf(num,den);
5 t = feedback(g,1)
6 stepinfo(t)
7 figure(1)
8 step(t,1);
9 kp1 = 300;
10 kp2 = 100;
11 %% introduction of p controller
12 cont = pid(kp1);
13 g1 = g*cont;
14 t1 = feedback(g1,1)
15 stepinfo(t1)
16 figure(2)
17 step(t1,1);
18
19 cont = pid(kp2);
20 g1 = g*cont;
21 t2 = feedback(g1,1)
22 stepinfo(t2)
23 figure(3)
24 step(t2,1);
```

Command Window

```
RiseTime: 0.0727
SettlingTime: 0.7724
SettlingMin: 0.7871
SettlingMax: 1.3131
Overshoot: 40.0588
Undershoot: 0
Peak: 1.3131
PeakTime: 0.1842

t2 =

    100
-----
s^2 + 10 s + 120

Continuous-time transfer function.

ans =

struct with fields:

    RiseTime: 0.1423
    SettlingTime: 0.7600
    SettlingMin: 0.7767
    SettlingMax: 0.9996
    Overshoot: 19.9567
    Undershoot: 0
    Peak: 0.9996
    PeakTime: 0.3224
```

$K_p=300, k_i=0, k_d=0$

```
1 % effects of p pi pd pid contr
2 num = 1;
3 den = [1 10 20];
4 g = tf(num,den);
5 t = feedback(g,1)
6 stepinfo(t)
7 figure(1)
8 step(t,1);
9 kp1 = 300;
10 kp2 = 100;
11 %% introduction of p controller
12 cont = pid(kp1);
13 g1 = g*cont;
14 t1 = feedback(g1,1)
15 stepinfo(t1)
16 figure(2)
17 step(t1,1);
18
19 cont = pid(kp2);
20 g1 = g*cont;
21 t2 = feedback(g1,1)
22 stepinfo(t2)
23 figure(3)
24 step(t2,1);
```

Command Window

```
t1 =

    300
-----
s^2 + 10 s + 320

Continuous-time transfer function.

ans =

struct with fields:

    RiseTime: 0.0727
    SettlingTime: 0.7724
    SettlingMin: 0.7871
    SettlingMax: 1.3131
    Overshoot: 40.0588
    Undershoot: 0
    Peak: 1.3131
    PeakTime: 0.1842

t2 =

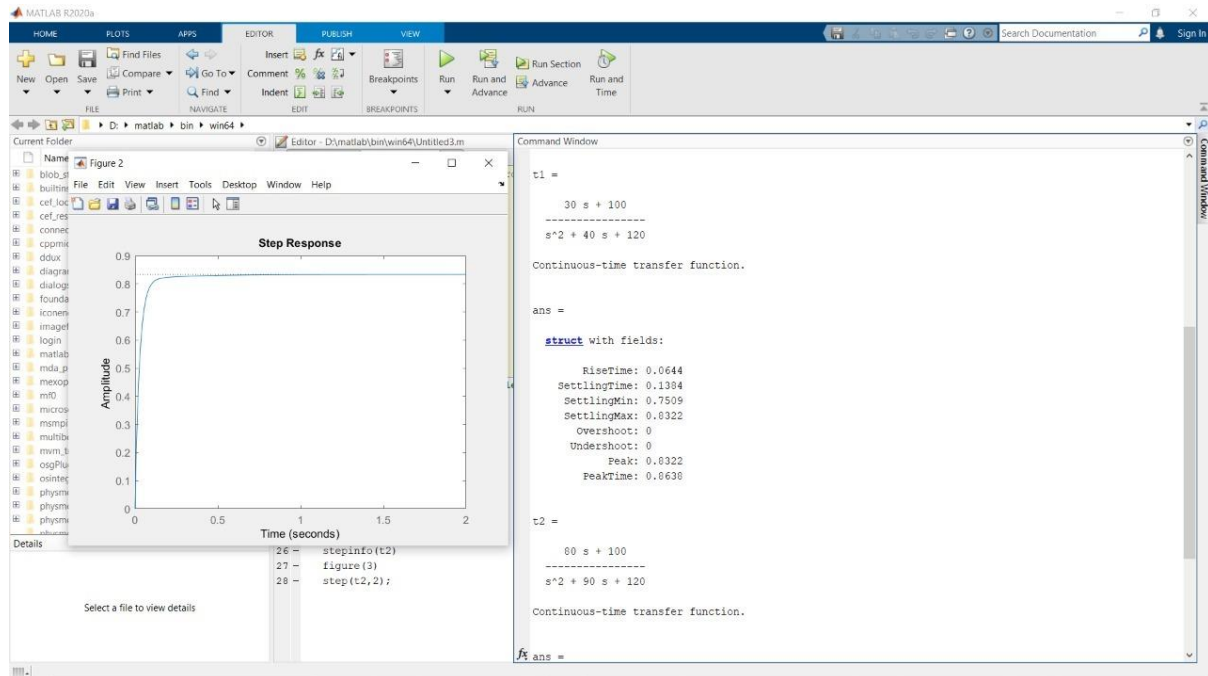
    100
-----
s^2 + 10 s + 120

Continuous-time transfer function.

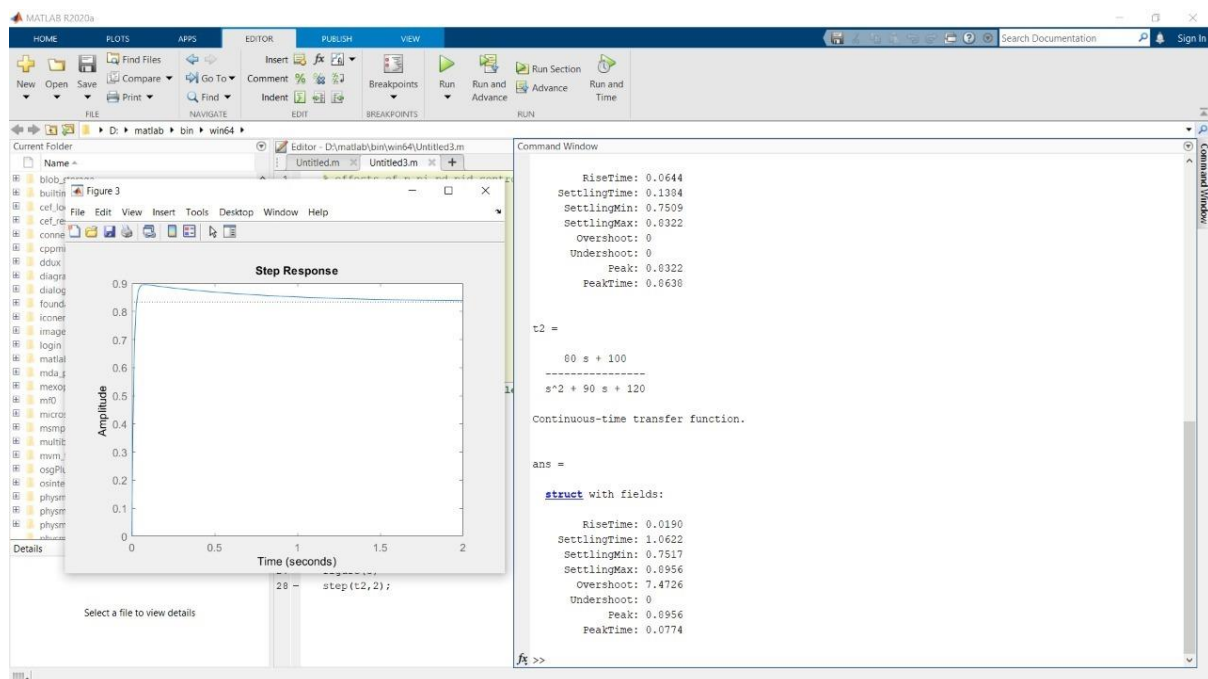
ans =
```

P-D Controller

$$K_p=100, k_i=0, k_d=30$$

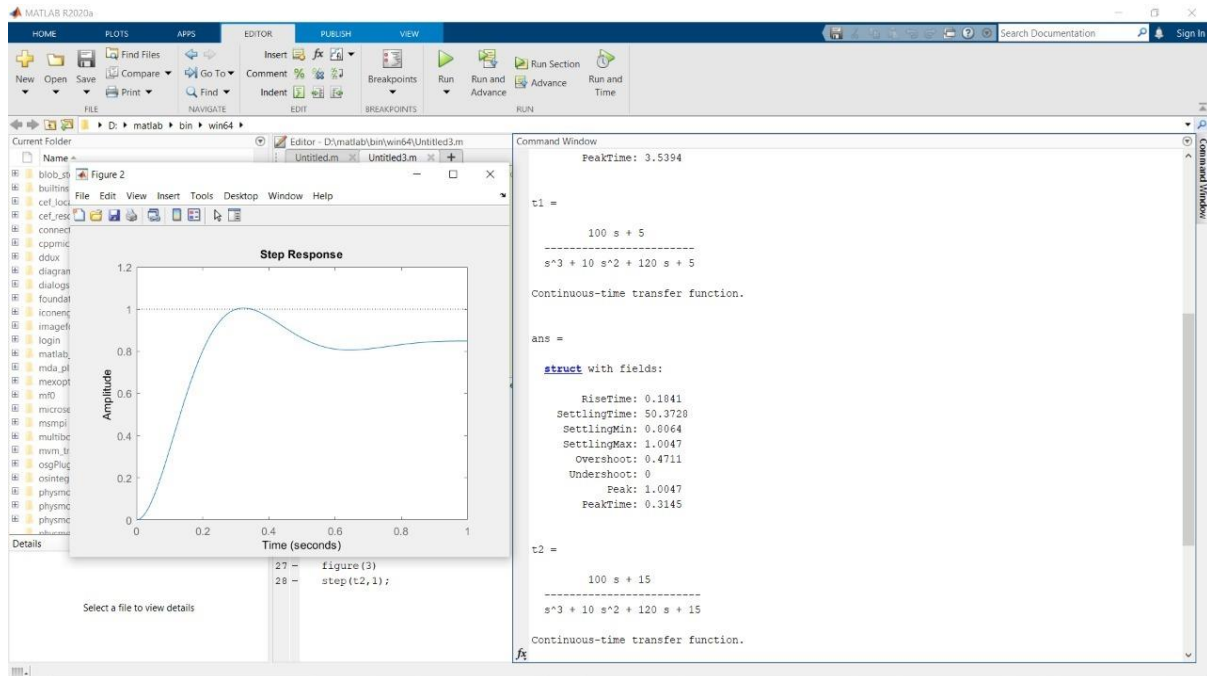


$$K_p=100, k_i=0, k_d=80$$

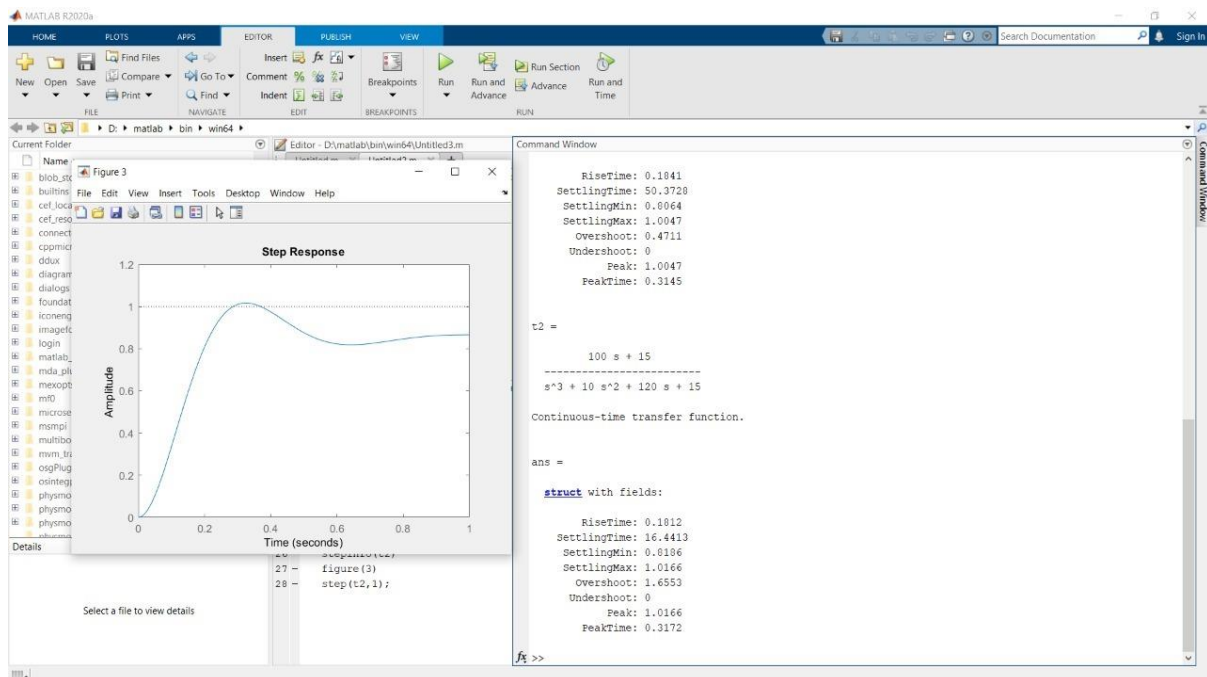


P-I Controller

$$K_p=100, k_i=5, k_d=0$$

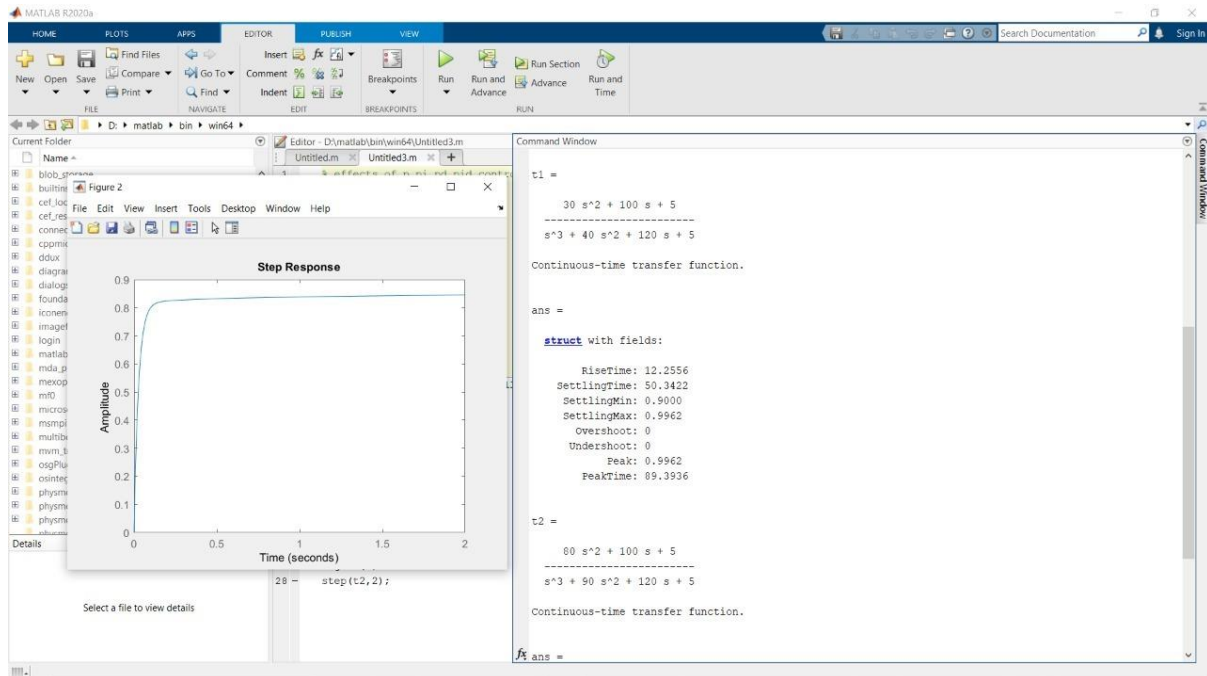


$$K_p=100, k_i=15, k_d=0$$

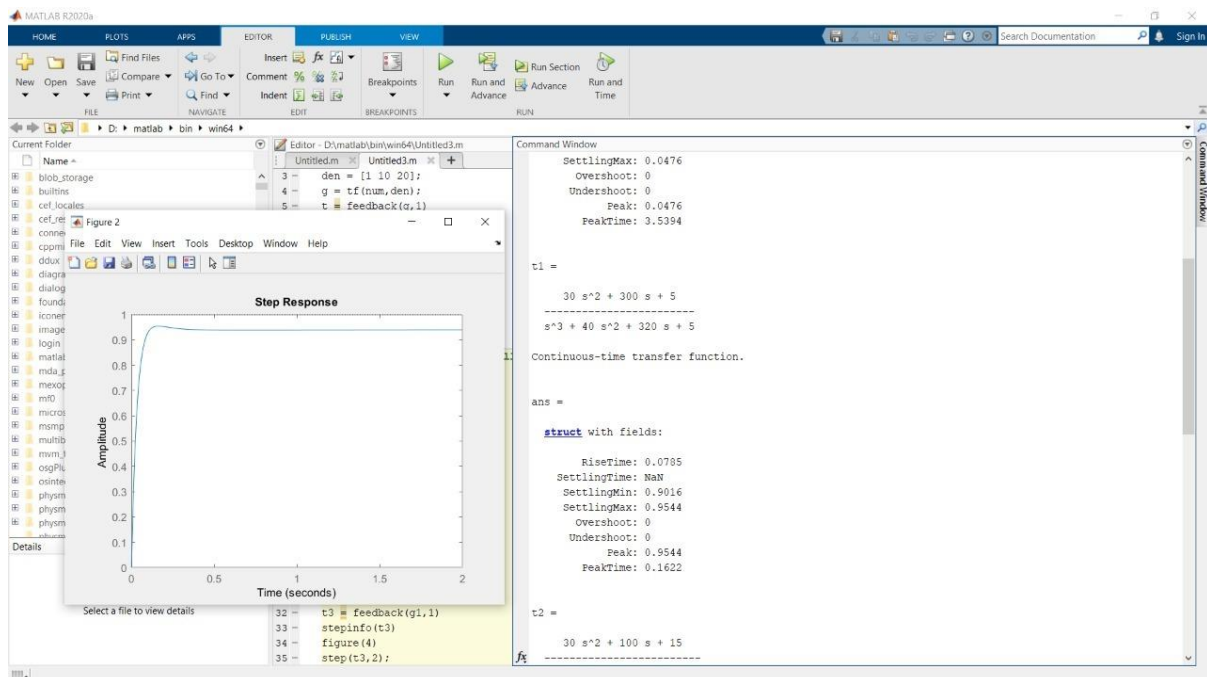


P-I-D Controller

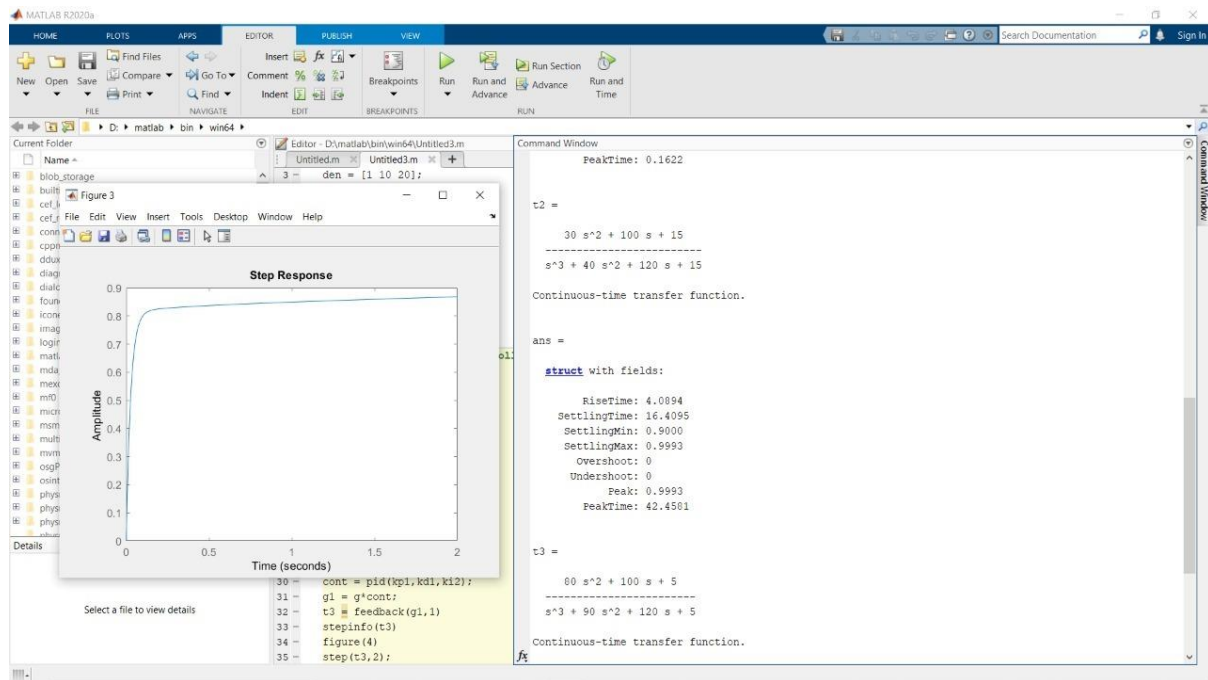
$$K_p=100, k_i=5, k_d=30$$



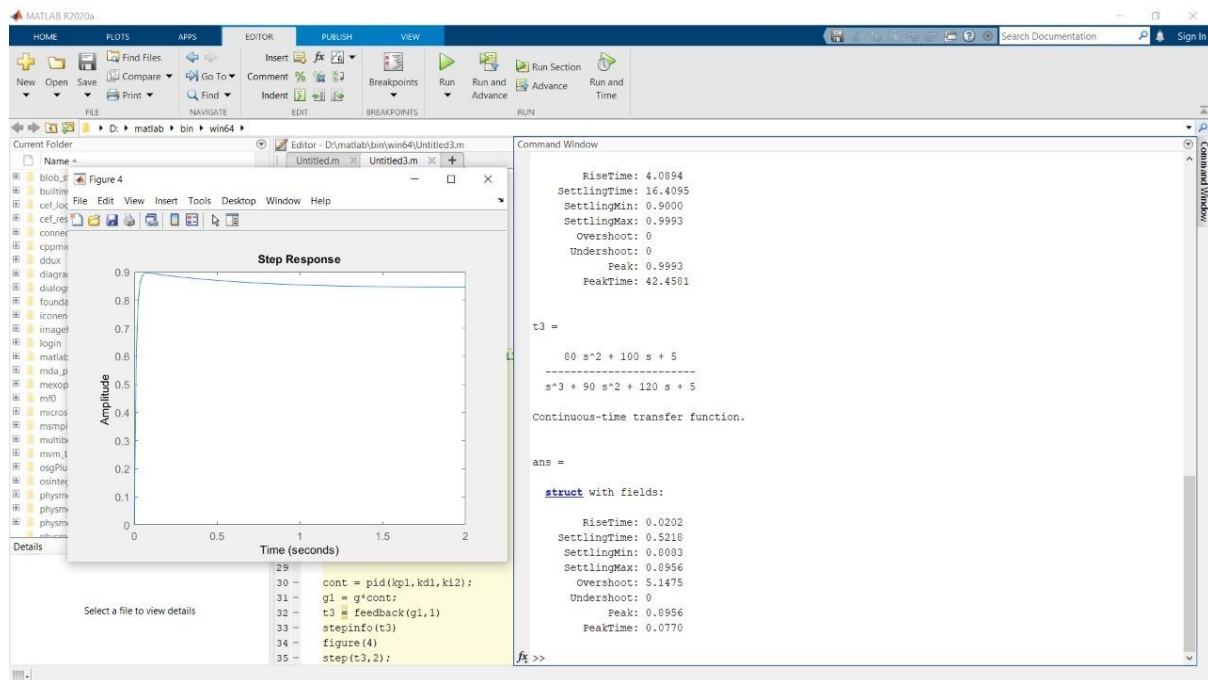
$$K_p=300, k_i=5, k_d=30$$



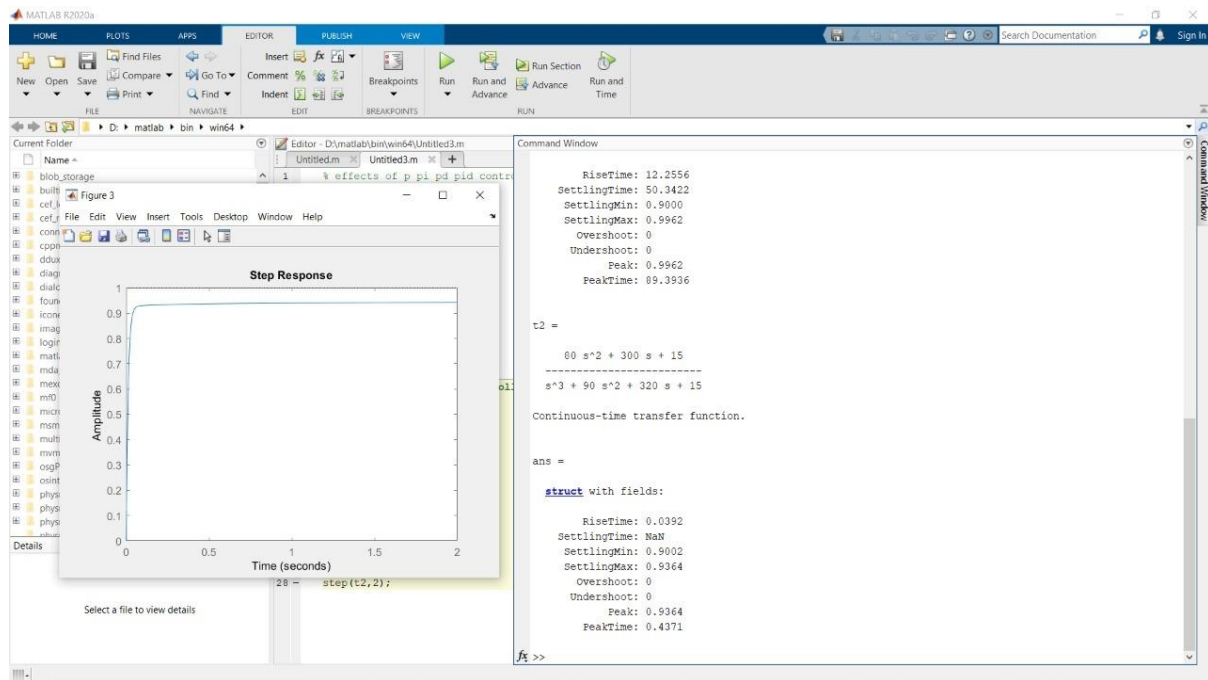
$K_p=100, k_i=15, k_d=30$



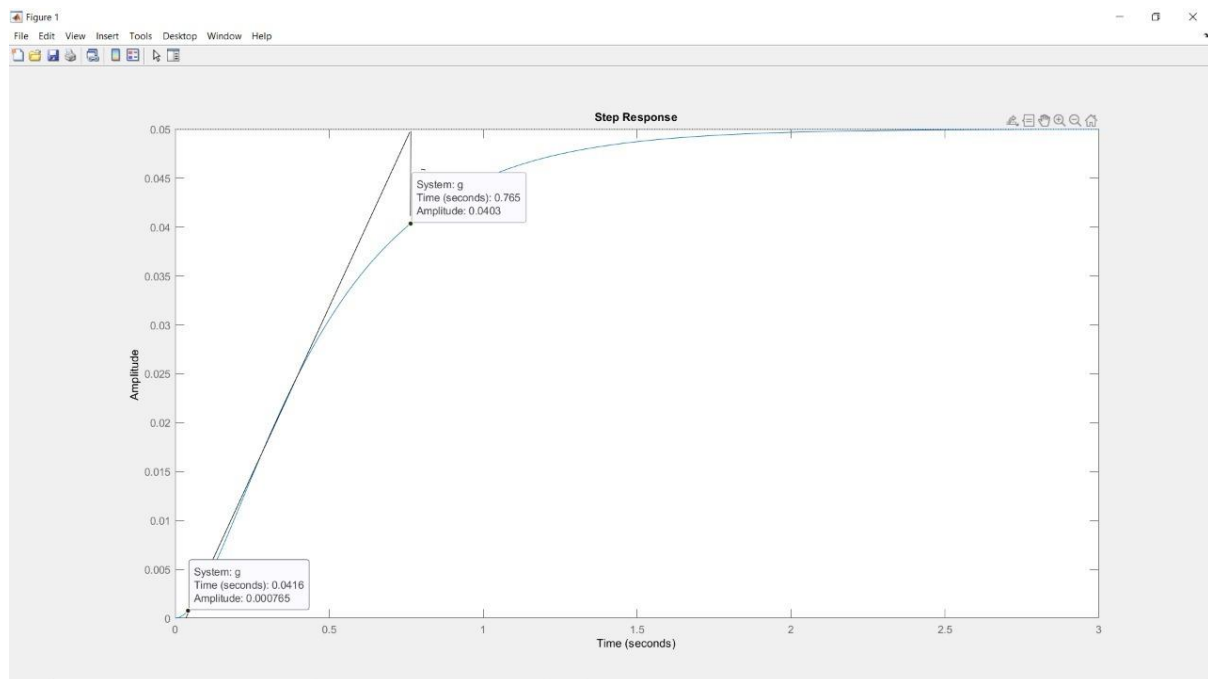
$K_p=100, k_i=5, k_d=80$



$K_p=300, k_i=15, k_d=80$



FOR OPTIMALUES OF PID CONTROLLER FROM
STEP RESPONSE METHOD BY ZIEGLER-NICHOLAS
RULES



PID Controller with OPTIMAL VALUES

$K_p=417.316, k_i=5016.177, k_d=8.68$

