**Code:**

%%Analysis of PID controller

clc;clear;

%% Transfer function

s = tf('s');

G = 1/(s^2 + 10\*s + 20);

figure(1)

step(G)

%% Proportional control

Kp = 300;

C = pid(Kp)

plant = C\*G;

T = feedback(plant,1)

t = 0:0.01:2;

figure(2)

step(T,t)

%% Proportional-derivative control

Kp = 300;

Kd = 10;

C = pid(Kp,0,Kd)

plant = C\*G;

T = feedback(plant,1)

t = 0:0.01:2;

figure(3)

step(T,t)

%% Proportional-integral control

Kp = 30;

Ki = 70;

C = pid(Kp,Ki)

plant = C\*G;

T = feedback(plant,1)

t = 0:0.01:2;

figure(4)

step(T,t)

%% Proportional-integral-derivative control

Kp = 350;

Ki = 300;

Kd = 50;

C = pid(Kp,Ki,Kd)

plant = C\*G;

T = feedback(plant,1)

t = 0:0.01:2;

figure(5)

step(T,t)

**Command:**

**C =**

**Kp = 300**

**P-only controller.**

**T =**

**300**

**----------------**

**s^2 + 10 s + 320**

**Continuous-time transfer function.**

**C =**

**Kp + Kd \* s**

**with Kp = 300, Kd = 10**

**Continuous-time PD controller in parallel form.**

**T =**

**10 s + 300**

**----------------**

**s^2 + 20 s + 320**

**Continuous-time transfer function.**

**C =**

**1**

**Kp + Ki \* ---**

**s**

**with Kp = 30, Ki = 70**

**Continuous-time PI controller in parallel form.**

**T =**

**30 s + 70**

**------------------------**

**s^3 + 10 s^2 + 50 s + 70**

**Continuous-time transfer function.**

**C =**

**1**

**Kp + Ki \* --- + Kd \* s**

**s**

**with Kp = 350, Ki = 300, Kd = 50**

**Continuous-time PID controller in parallel form.**

**T =**

**50 s^2 + 350 s + 300**

**--------------------------**

**s^3 + 60 s^2 + 370 s + 300**

**Continuous-time transfer function.**

**>>**