Cruise Control Problem

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Vehicle Parameters

```
m = 2085;        % mass, kg
k = 40;          % throttle force constant, N/deg
b0 = -336.4;     % wind drag b0+b1*v where b0 is in N
b1 = 23.2;       % wind drag b0+b1*v where b1 is in N/(m/sec)
Froll = 228;     % Rolling resistance, N
```

A) Open-Loop Input

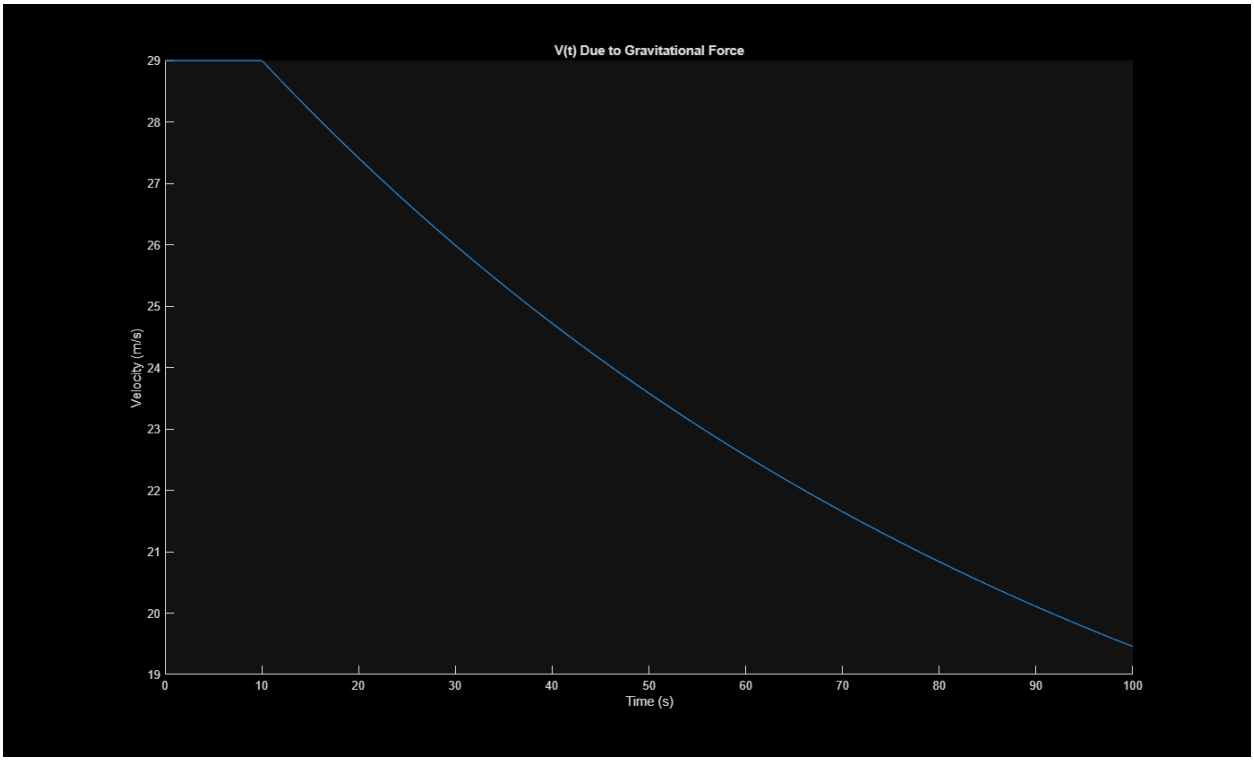
Assume Fgrav=0 and compute the constant input required to maintain vdes=29m/sec

```
ubar = 14.11;
```

B) Simulation with open-loop input and disturbance

Simulation Parameters

```
Fgrav_final = 350;
Ki = 0;
Kp = 0;
% Simulate System
load_system('CruiseControlSim.slx');
simOut = sim('CruiseControlSim.slx');
figure;
hold on;
% Generate Plot
tout = simOut.get('tout');
v_out = simOut.get('v');
plot (tout, v_out);
xlabel ('Time (s)');
ylabel ('Velocity (m/s)');
title('V(t) Due to Gravitational Force');
hold off;
```



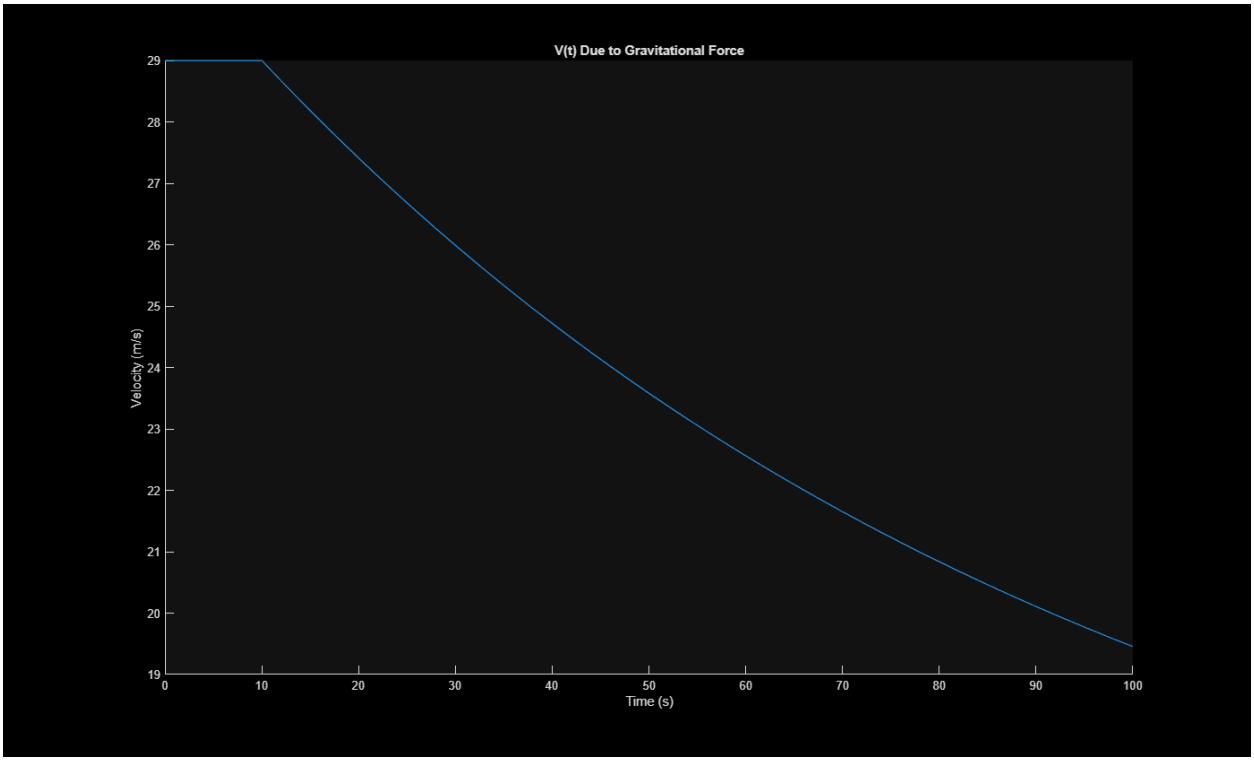
C) Selection of PI gains

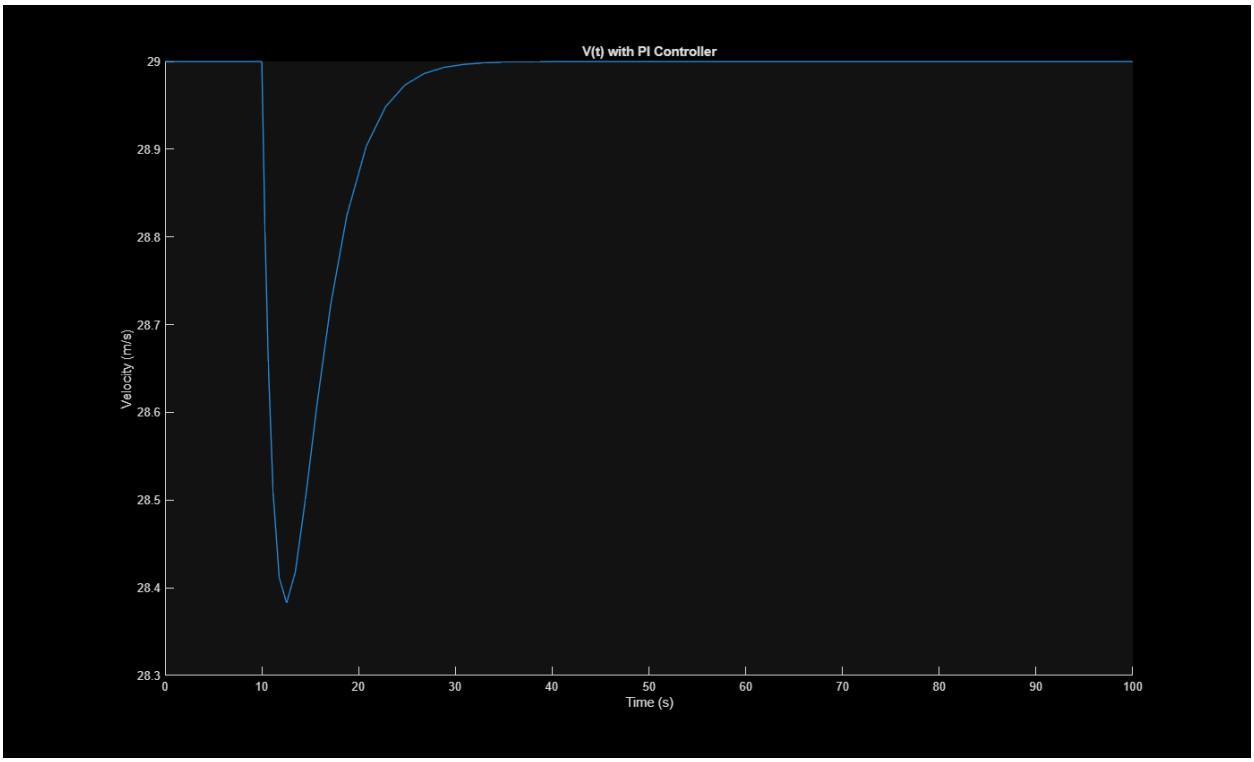
```
Ki = 8.34;
Kp = 41.12;
Fgrav_final = 1400;
```

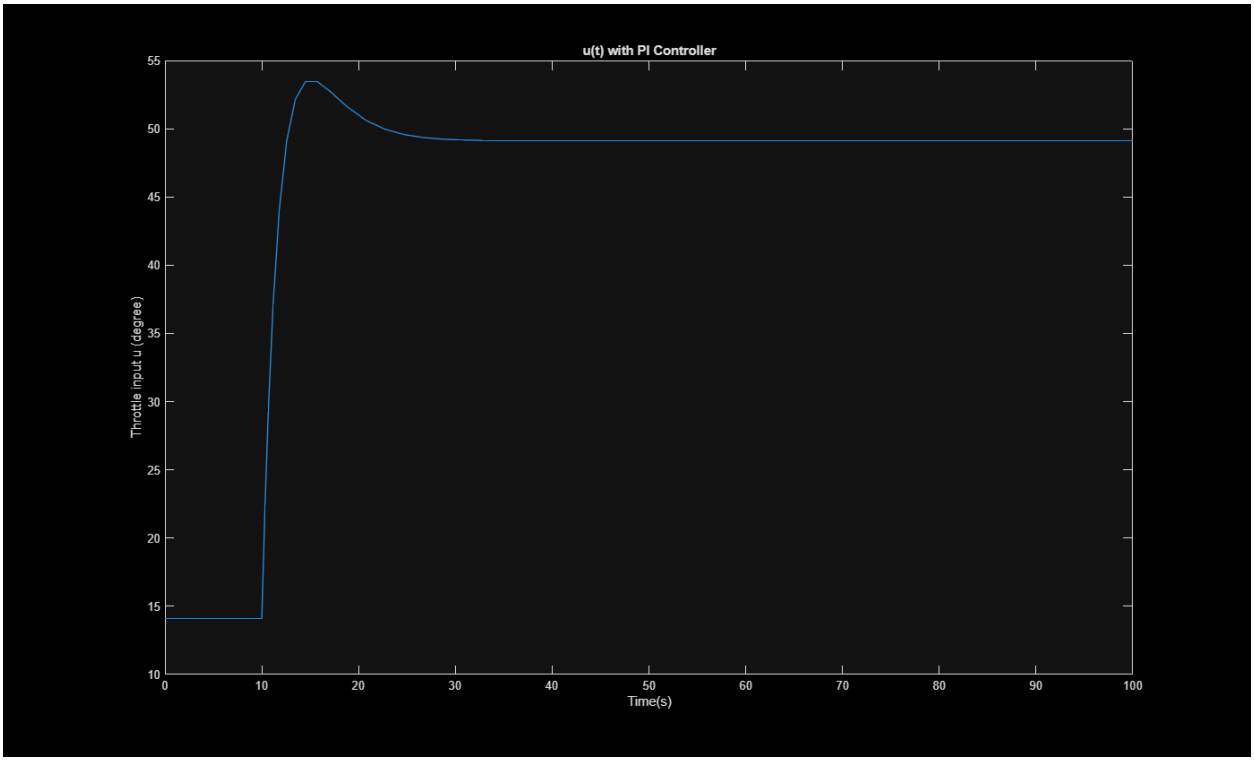
D) Simulation with PI and disturbance

```
simOut = sim('CruiseControlSim.slx');
figure;
hold on;
tout = simOut.get('tout');
v_out = simOut.get('v');
plot (tout, v_out);
xlabel ('Time (s)');
ylabel ('Velocity (m/s)');
title('V(t) with PI Controller');

u_out = simOut.get('u');
figure;
plot (tout, u_out);
xlabel('Time(s)');
ylabel ('Throttle input u (degree)');
title ('u(t) with PI Controller');
```


V(t) Due to Gravitational Force
Velocity (m/s)
Time (s)
29
28
27
26
25
24
23
22
21
20
19
0
10
20
30
40
50
60
70
80
90
100


V(t) with PI Controller
Velocity (m/s)
Time (s)
29
28.9
28.8
28.7
28.6
28.5
28.4
28.3
0
10
20
30
40
50
60
70
80
90
100



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