Assignment 6
Performance Specs

Nusair Islam

1 and 2. Develop Simulink model of Maxim Motor and find calculated vs datasheet %err

Nominal V = 12V

Terminal R = 19.2 Ohm

Km = 18.0 mNm/A

Kb = 531 rpm/V

Rotor Inertia = 1.03gcm^3

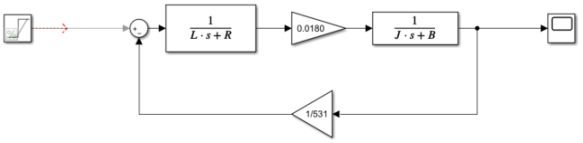
Terminal L = 0.581mH

No load angular velocity = 6260 rpm

No load current = 11mA

Bearing resistance (B) = 3.163*10^{-8} Nm/rpm

Mechanical time constant = 6.67 ms



FV angular velocity = 6094 rpm

% err = 2.652%

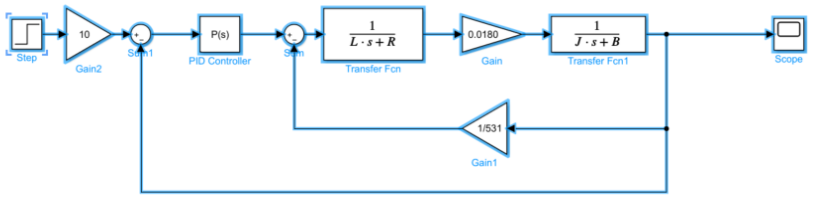
FV current = 11mA

% err = 0%

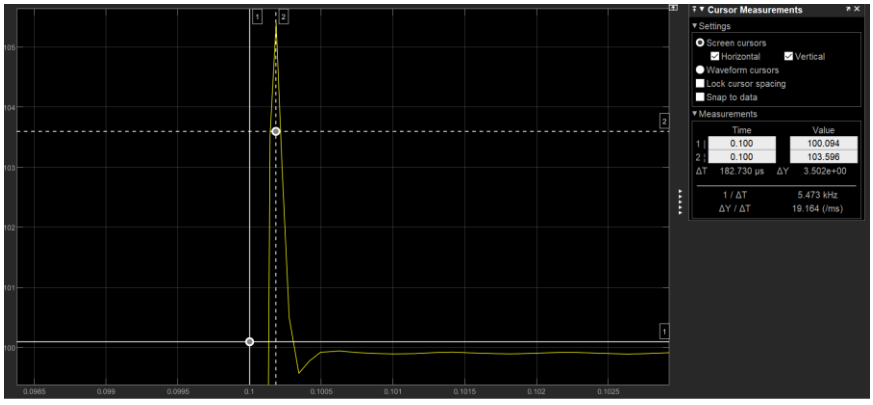
FV Mech time constant = 57.6ms

% err = 764% (I'm not sure why my time constant is so off)

Part 3


Step
10
Gain2
P(s)
PID Controller
$\frac{1}{L \cdot s + R}$
Transfer Fcn
0.0180
Gain
$\frac{1}{J \cdot s + B}$
Transfer Fcn1
Scope
1/531
Gain1

Part 4 and 6



Setting my P(s) controller to be a gain of 2, I have an OS of around 6%

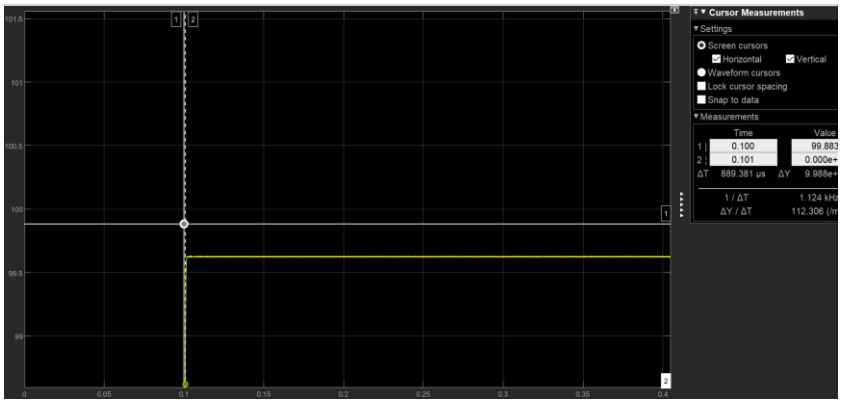
Tpeak = 182.7us

Trise = 132.3us

Tsteady state = 889.4us

%err = (99.883 – 100)/100 * 100% = 0.117%

Part 5 and 6



Setting my P(s) controller to be a gain of 0.5, I have an OS of around 0%

Tpeak = 1.936ms

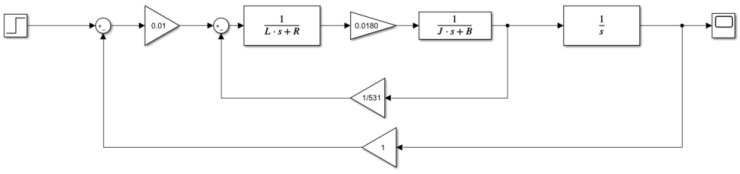
Trise = 1.936ms

Tsteady state = 1.936ms

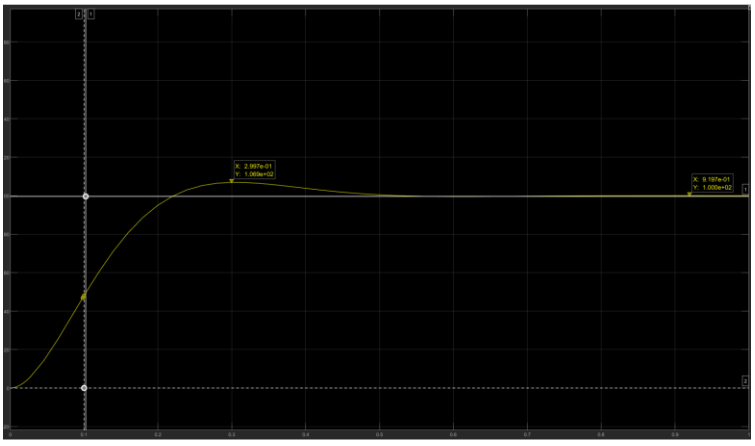
%err = (99.964 – 100)/100 * 100% = 0.036%

Part 7

I change my first gain block to create my necessary overshoots



Part 7



Setting gain to 0.02, I got an %overshoot = 6.9%

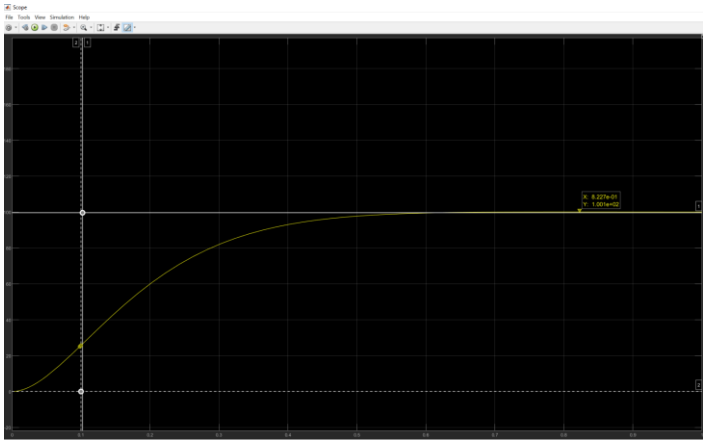
Tpeak = 299.7ms

Trise = 218.2ms

Tsteady state = 555.5ms

% err = (100-99.624)/100*100% = 0.376%

Part 7



Setting gain to 0.01, I got an %overshoot = 0%

Tpeak = 8.23ms

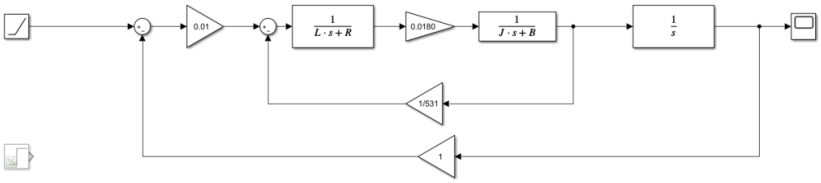
Trise = 8.23ms

Tsteady state = 8.23ms

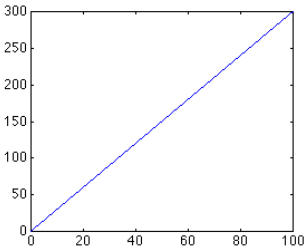
% err = (100-100.1)/100*100% = 0.1%

Part 8

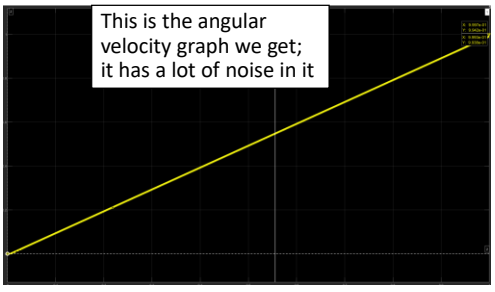
This system has a ramp function and an additional step TF to convert angular speed to angle. If I wanted angle, I would remove the final step TF



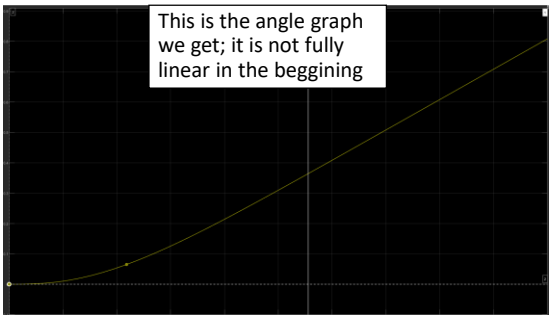
Part 8



This is the graph that we want, a fully linear graph



This is the angular velocity graph we get; it has a lot of noise in it



This is the angle graph we get; it is not fully linear in the beggining