Activity 2

3/5/21 Michael White Section 3 / Online

```
close all;
clear all;
clc;

% Define parameters to be used
Kt = 7.68e-3;
Kb = 7.68e-3;
L = 0.18e-3;
J = 3.9e-7;
bm = 8.148e-7;
Ra = 2.6;

% Run the simulation
simout = sim('DC_Motor_Simulation_Act2');

% Generate figure and plot results
figure;
hold on;
plot(simout.Speed);
xlabel('Time (sec)');
ylabel('Angular Velocity (rad/sec)');

% WRITTEN RESPONSES:

% This system is clearly a first order system response, as it is simply
% rising up to the maximum value in each trial, and not overshooting.
% In addition, the governing function is a first order equation.

% This activity asks for the max RPM that the motor reaches, but the output
% for this system is in radians per second. This conversion and output can
% be seen below, with the result being written to the command window.

% Calculating the max RPM (including conversion from rad/sec)
maxRPM = max(simout.Speed.Data)*9.5492965;
disp(strcat("The max RPM reached by the motor is ",num2str(maxRPM)));

% Isolating the data to the first curve (contained in first 0.2 seconds)
calculationData = simout.Speed.Data(simout.Speed.Time <= 0.2);
calculationTime = simout.Speed.Time(simout.Speed.Time <= 0.2);

% Finding the time constant using the 63.2% method
maxValue = max(calculationData);
timeConstantValue = maxValue*0.632;
absDiffList = abs(calculationData-timeConstantValue);
timeConstantPoint = ...
    [calculationTime(absDiffList == min(absDiffList)),...
     calculationData(absDiffList == min(absDiffList))];

% Display the calculated time constant
disp(strcat("The time constant of the system is ",num2str(timeConstantPoint(1))));
```

```
The max RPM reached by the motor is 6001.5095
The time constant of the system is 0.016463
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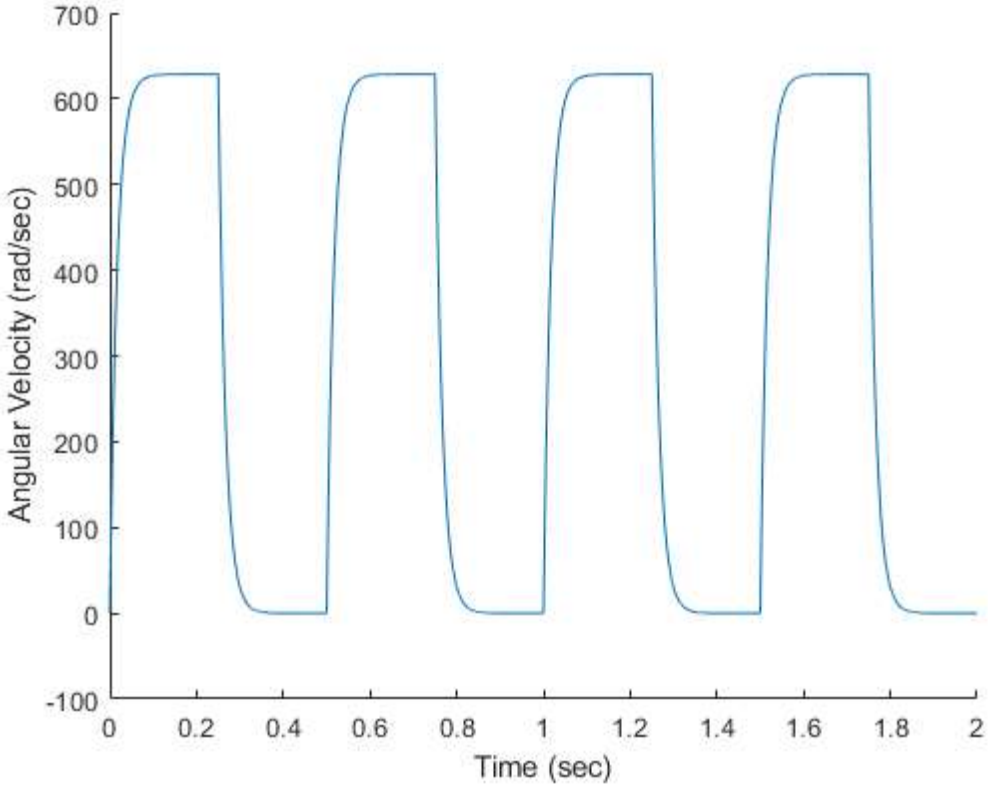

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