MAE/ECE-5320 LAB 04: DC MOTOR FEEDFORWARD CONTROL AND ENCODER READING

Excise 1: control motor direction

A. Switch pin 2 to ON/OFF, and pin 3 to ON/OFF. Face the motor shaft and observe the rotation direction and complete the following table. (put *clockwise*, *counterclockwise* and *stationary*)

Switch 1	Switch 2	Direction
1	**0**	Counterclockwise
0	**1**	Clockwise
1	**1**	Stationary
0	**0**	stationary

B. Using switch 1 = 1 and switch 2 = 0, List the power voltage you used and describe the speed at each duty cycle value

Power Voltage	5V
Duty Cycle Value	Description
0	no movement
50	No movement
150	slow
255	faster

Power Voltage	11V
Duty Cycle Value	Description
0	no movement
50	slow
150	faster
255	Very fast

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**Excise 2: Open-loop speed control**

Construct the Simulink model using MATLAB Function block, saturation, and scope.
Set the upper limit of saturation to 255, and lower limit to 0.
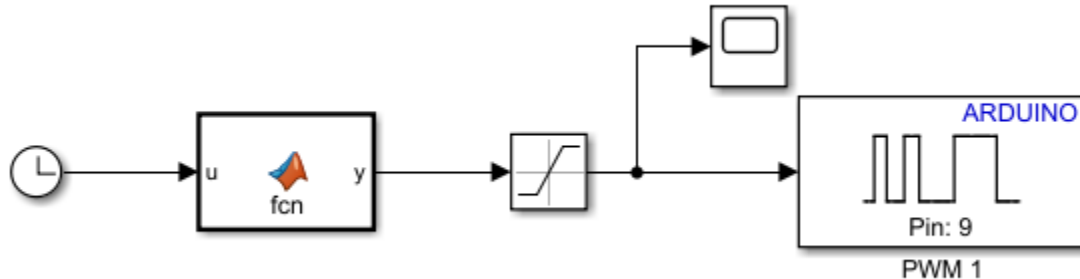
Try to write a <u>MATLAB function script</u> to generate the duty cycle function so that open-loop motor speed following $\dot{\theta} = \omega_{max}sin(0.2 * t)$. (Hint: duty cycle 255 is corresponding to maximum rotation speed.)

<u>Attach your MATLAB Function script, block diagram, and scope response. Describe in 2-3 sentences how your motor is acting with respect to the scope in terms of speed amount, timing, and rotation direction,</u>

★Set scope settings: View=> Configuration Properties => Time. In time span select "<user-defined>" then click on the "<user-defined>" words and type in 50. Set "Time span orverrun
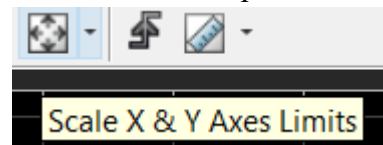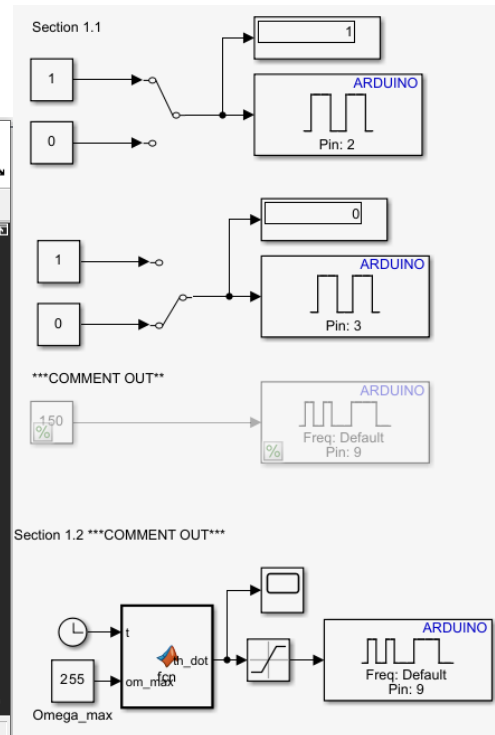

action to "Scroll". Apply the changes. Use the scaling button on the main scope page to see the full function.

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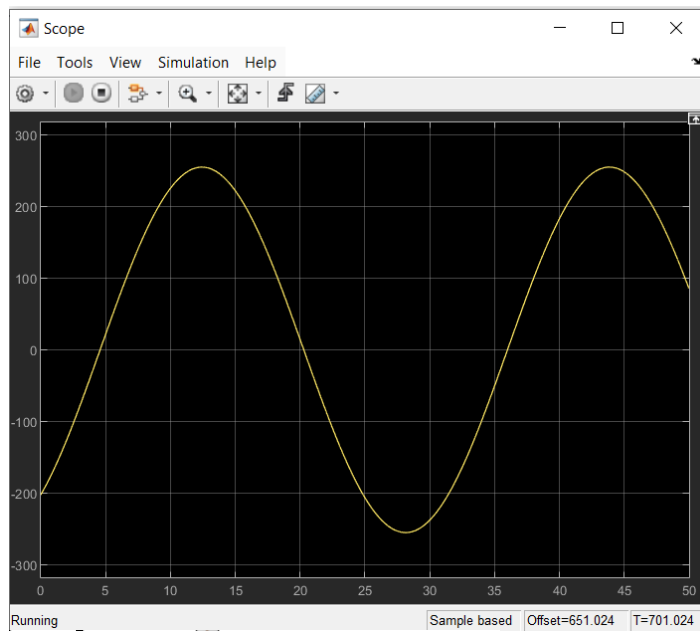

```
function th_dot = fcn(t,om_max)
    th_dot = om_max*sin(0.2*t);
end
```

The motor rotates counter clockwise when the scope sinusoid is positive and is stationary otherwise. The motor speed increases with sinusoid amplitude.