ENGR 1182
AEV Lab Proficiency Quiz Review
Rules for the Lab Proficiency Quiz

- A 30 minute quiz on Carmen
- Closed book/notes
- Equation sheet will be provided
- Cell phones off
- Test is done individually
- Be on time
- Bring a calculator and a pencil or pen
- Location: Your lab room at the beginning of Lab 8
- Format
  - Short Answer
  - Calculations
  - Multiple choice
Lab 2: Arduino Programming Basics

- Give a brief explanation of the following:
  - `celerate(1,0,20,5);`
    - Accelerate motor 1 from 0% to 20% in 5 seconds
  - `motorSpeed(4,23);`
    - Set motor speed to 23% for all motors
  - `goFor(3);`
    - Continue previous statement for 3 seconds
  - `brake(4);`
    - Brake all motors
Lab 2: Arduino Programming Basics

- If I have to write a very simple code I will
  - A.) not forget the semi-colon ;
  - B.) not forget what letters are in CAPS (syntax)
  - C.) Remember the proper arguments for 7 basic commands
  - D.) not forget the semi-colon ;
  - E.) All of the above because I studied my stuff and I am going to ace this test!
goFor(____); has one argument inside the parenthesis. What is that argument and how is it inputted?
- Time, in seconds.

reverse(____); what argument goes inside the parenthesis?
- Motor number
What is the object on the left and what is it used for?

- Reflectance Sensor
  - Used to compute distance
  - Used to determine relative position

In ONE wheel revolution how many marks/counts will be recorded?

- 8 marks
Lab 4: External Sensors

- `goToRelativePosition( ____ );`
  - I want the AEV to go for 4 feet (48 inches), what do I put as the input in the function call above?
  - Note: There are 0.4875 inches/mark. Round to the nearest whole number.
    - Marks = 48 / 0.4875 = 98.4615 = 98 marks.

- `goToAbsolutePosition( ____ );`
  - Same functionality as `goToRelativePosition()`, but what is different?
    - Keeps Track of cumulative marks instead of relative marks
Lab 2: Arduino Programming Basics Continued

- I want to write a code to have the AEV
  - Accelerate all motors from 0 to 26 percent power in 4 seconds.
    - accelerate(4,0,26,4);
  - Set motor 1 motor speed to 30 percent power.
    - motorSpeed(1,30);
  - Continue the previous statement for 10 seconds.
    - goFor(10);
  - Decelerate motor 2 to zero percent power in 9 seconds
    - accelerate(2,26,0,9);
Lab 5: System Analysis I

Given the following EEPROM Data can you calculate (Reference Voltage is $V_R=2.46$):

- **Time** \( t = \frac{t_e}{1000} \):
  - 1.056 seconds

- **Current** \( I = \left( \frac{I_E}{1024} \right) \times V_R \times \left( \frac{1 \text{ Amp}}{0.185 \text{ Volts}} \right) \):
  - 1.19 Amps

- **Voltage** \( V = \frac{15 \times V_E}{1024} \):
  - 7.05 Volts
Lab 5 & 6: System Analysis I and System Analysis II

Given the following Data can you calculate:

- **Distance** \( s = 0.0124 \times \text{Marks} \)
  - \( s = [0.73, 0.77] \text{ Meters} \)

- **Velocity** \( v_i = \frac{s_i - s_{i-1}}{t_i - t_{i-1}} \)
  - \( v = 0.20 \text{ m/s} \)

- **Supplied Power** \( P = V \times I \)
  - \( P = [0.1835, 0.1819] \text{ Watts} \)

- **Incremental Energy** \( E_i = \frac{P_i + P_{i+1}}{2} \times (t_2 - t_1) \)
  - \( E_i = 0.0359 \text{ Joules} \)

<table>
<thead>
<tr>
<th>Time (sec)</th>
<th>Current (Amps)</th>
<th>Voltage (Volts)</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4582</td>
<td>0.0234</td>
<td>7.84</td>
<td>59</td>
</tr>
<tr>
<td>4.6545</td>
<td>0.0232</td>
<td>7.84</td>
<td>62</td>
</tr>
</tbody>
</table>
Propeller Advance ratio is a function of what three variables:
- Velocity, RPM, Propeller Diameter

\[ J = \frac{v}{\left(\frac{RPM}{60}\right)*D} \]

Bonus: What theorem was the advance ratio derived using?
- Buckingham PI Theorem
Compute the Propeller Advance Ratio. *(Note: Assume with power & remember constraints in \( J \)).* You are using a 3 inch propeller. Round to the nearest **hundredth**.

- The RPM is 1235.10 rpm and the velocity is 0.12 m/s
  - 0.08
  - BUT applying the constraint we get 0.15
- The RPM is 1211.23 rpm and the velocity is 0.24 m/s
  - 0.156 .... are we within the constraints??
  - YES!!!
Lab 7: System Analysis III

- Given the following setup, what is the propeller configuration?
  - Pusher

- What is the other configuration?
  - Puller/Tractor