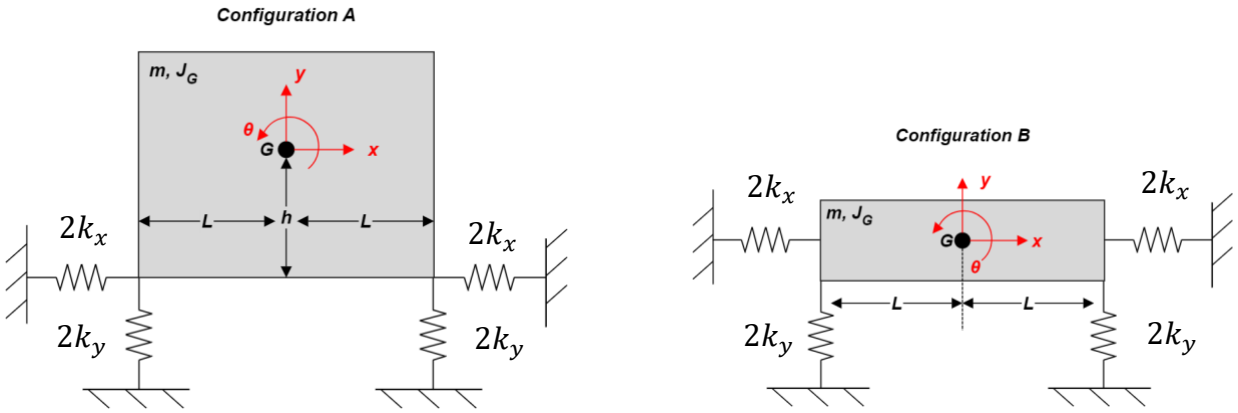
Lab 3 Assessment Questions

Please type your submission and submit your answers as a PDF with the Excel data file separately.

Each configuration of the platform can be modelled as shown:



1. **(3 pts)** Determine the system of equations of motion using the coordinates $\begin{Bmatrix} x \\ y \\ \theta \end{Bmatrix}$ for Configuration A.

2. **(1 pt)** Determine the system of equations of motion using the coordinates $\begin{Bmatrix} x \\ y \\ \theta \end{Bmatrix}$ for Configuration B.

Assume that $m = 13$ kg, $L = 270$ mm, and $k_y = 2.8$ kN/m.

Using your collected data for the platform in Configuration B:

3. **(1 pt)** Estimate the lateral spring stiffness k_x.

4. **(1 pt)** Estimate the moment of inertia J_G of the platform.

For your collected data for the platform in Configuration A:

5. **(2 pts)** Use your data to estimate the natural frequencies ω_{n1} and ω_{n2}. Estimate the frequencies using both the translational acceleration and angular velocity data sets and report your natural frequencies as an average of the two values.

6. **(2 pts)** Calculate the amplitudes of $x(t)$ and $\theta(t)$ in each mode using their corresponding data sets. Use your calculated amplitudes to estimate the magnitude of the ratio $\frac{\mathbb{X}}{\Theta}$ in the first and second modes.

7. **(1 pt)** Based on your visual observations of each mode shape and nodal locations for Configuration A, determine the sign of $\frac{\mathbb{X}}{\Theta}$ (positive or negative) for each mode **based on the provided coordinate system.**

For the following questions, use your equations of motion from Question 1 and values from Question 3 to Question 7.

8. **(2 pts)** Estimate the value of h using your values for the first mode.

9. **(2 pts)** Estimate the value of h using your values for the second mode.