MECA-H303 Vibration TP3

Lagrangian dynamics

Pinned bar vibrating

For the following system:

1. Derive the equations of motion of the system using Lagrangian dynamics.
2. Linearise the system and write the equations of motion in matrix form.
3. Write the expression of the resonant frequencies and eigen modes of the system.

Additional details for the exercise:

- Assume small angles of rotation and neglect second order terms for te linearisation.
- $\sin(\alpha)\sin(\beta) + \cos(\alpha)\cos(\beta) = \cos(\alpha - \beta)$
- The weight of the bars is negligeable
- The final answer should be expressed as a function of the coordinates on the schematic

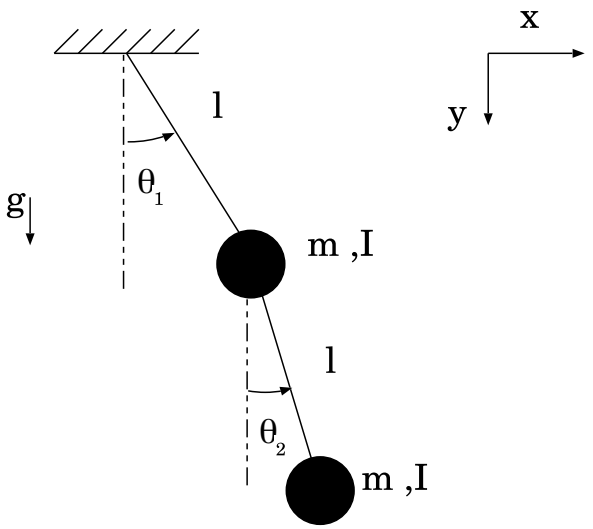

Figure 1: Double Pendulum with discs