MECA-H303 Vibration TP1

Kinematics & Statics

Simple lift mechanism

For the following mechanism, we ask you to:

1. Calculate the number of degrees of freedom
2. Write the constraint equations
3. Using the principle of virtual work, express the ratio between F_x and F_y as a function of the system's coordinates, when the system is in static equilibrium.

Additional details for the exercise:

- Use the coordinate system centered on point C
- Lengths $|AE| = |BE| = |CE| = |DE| = L$
- The mass of all bars is negligible
- The final answer should be expressed as a function of the coordinates on the schematic

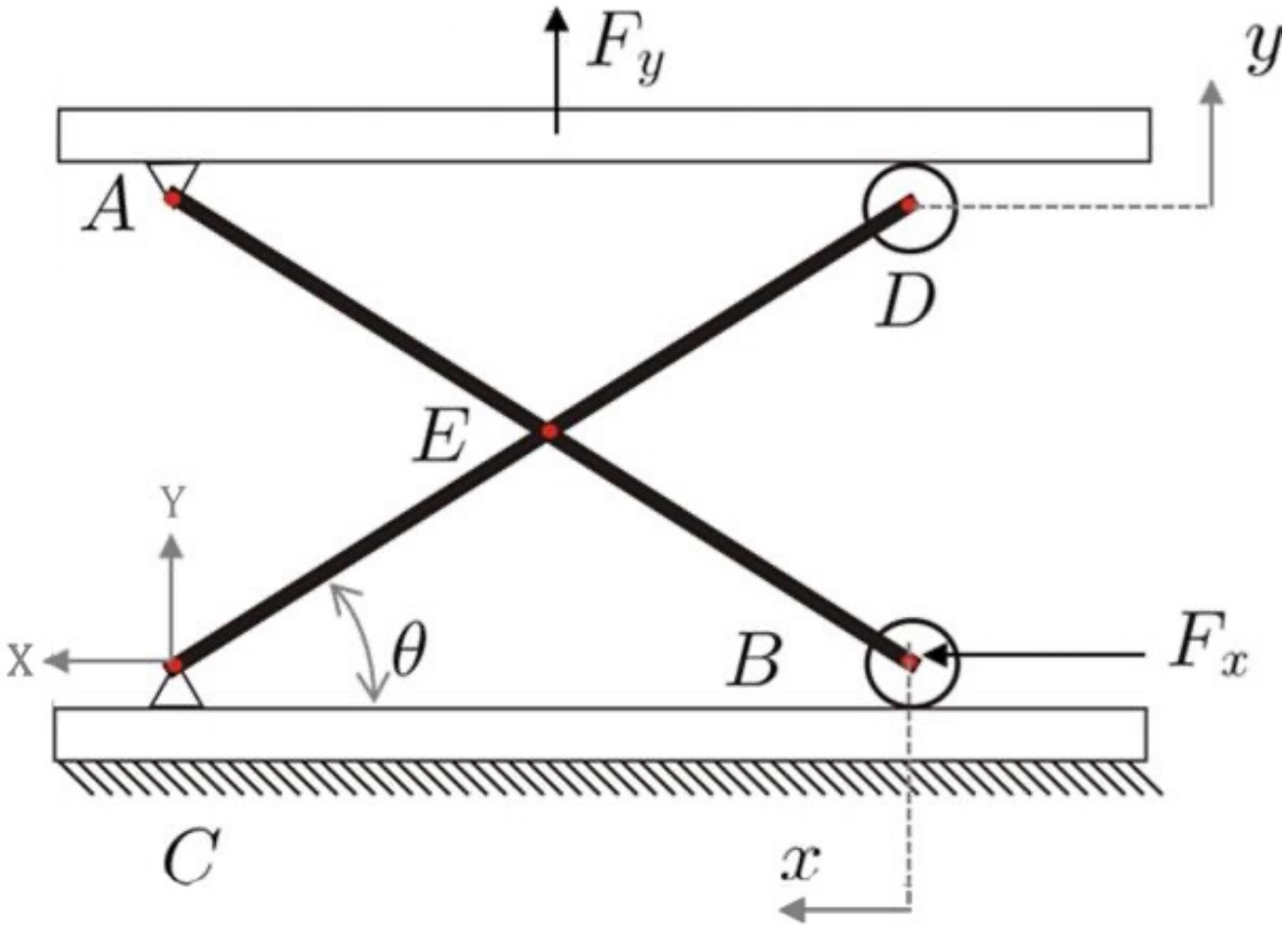

Figure 1: simple lift mechanism

Simplified crane

For the following mechanism, we ask you to:

1. Calculate the number of degrees of freedom
2. Write the constraint equations
3. Using the principle of virtual work, express the ratio between the mass m and the applied torque M for the system to be in static equilibrium

Informations additionnelles :

- The long bar has a length of $2l$
- The short bar has a length of l and is connect with a hinge to the middle of the long bar
- The mass m is fixed to the end of the long bar
- The mass of all bars is negligible
- The final answer should be expressed as a function of the coordinates on the schematic

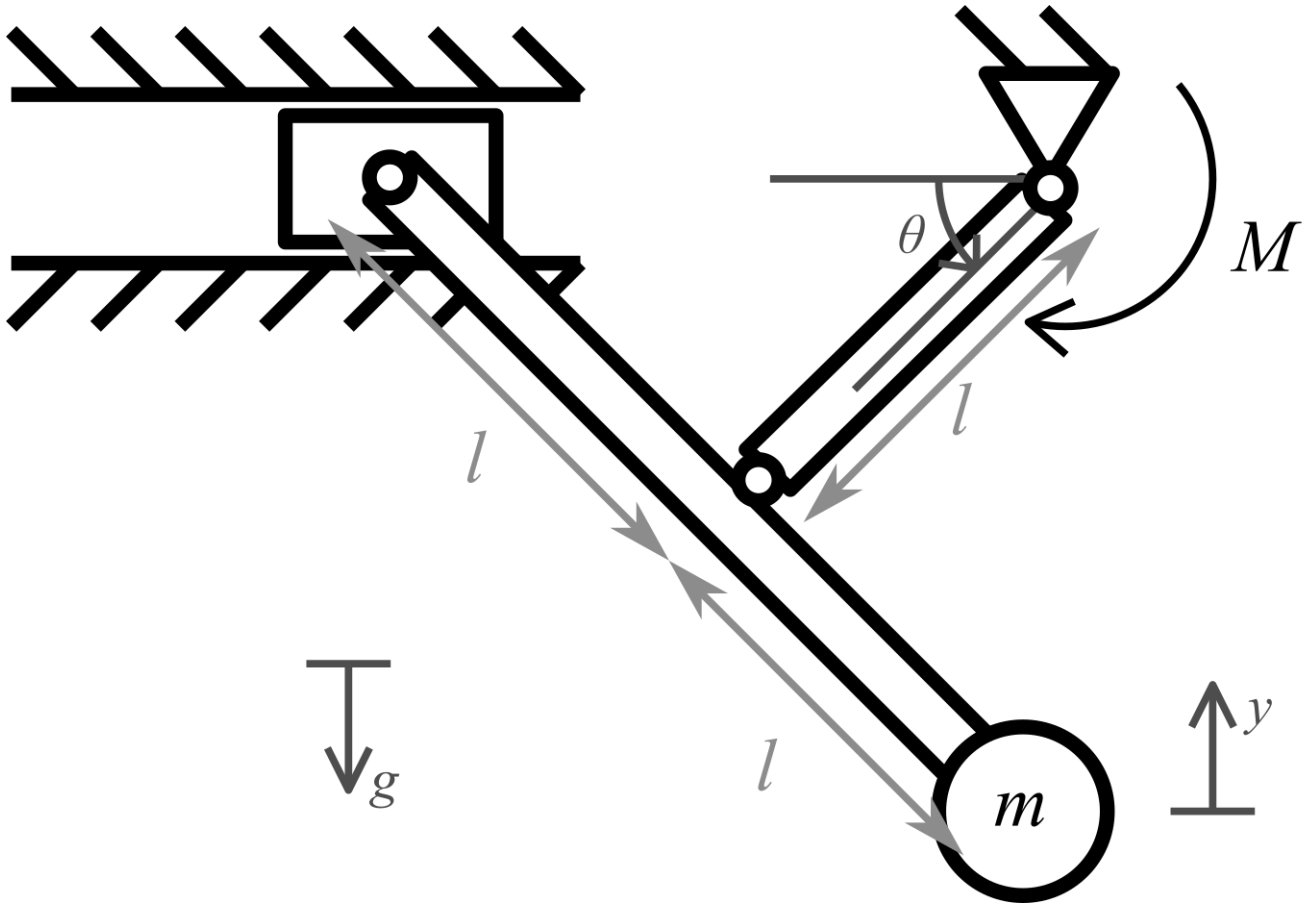

Figure 2: simplified crane

Crank and slider

For the following mechanism, we ask you to:

1. Calculate the number of degrees of freedom
2. Write the constraint equations
3. Using the principle of virtual work, express the ratio between the force F and the torque C applied as a function of the system's coordinates, when the system is in static equilibrium.

Additional details for the exercise:

- DC is one rigid bar pinned in point P
- The final answer should be expressed as a function of the coordinates on the schematic

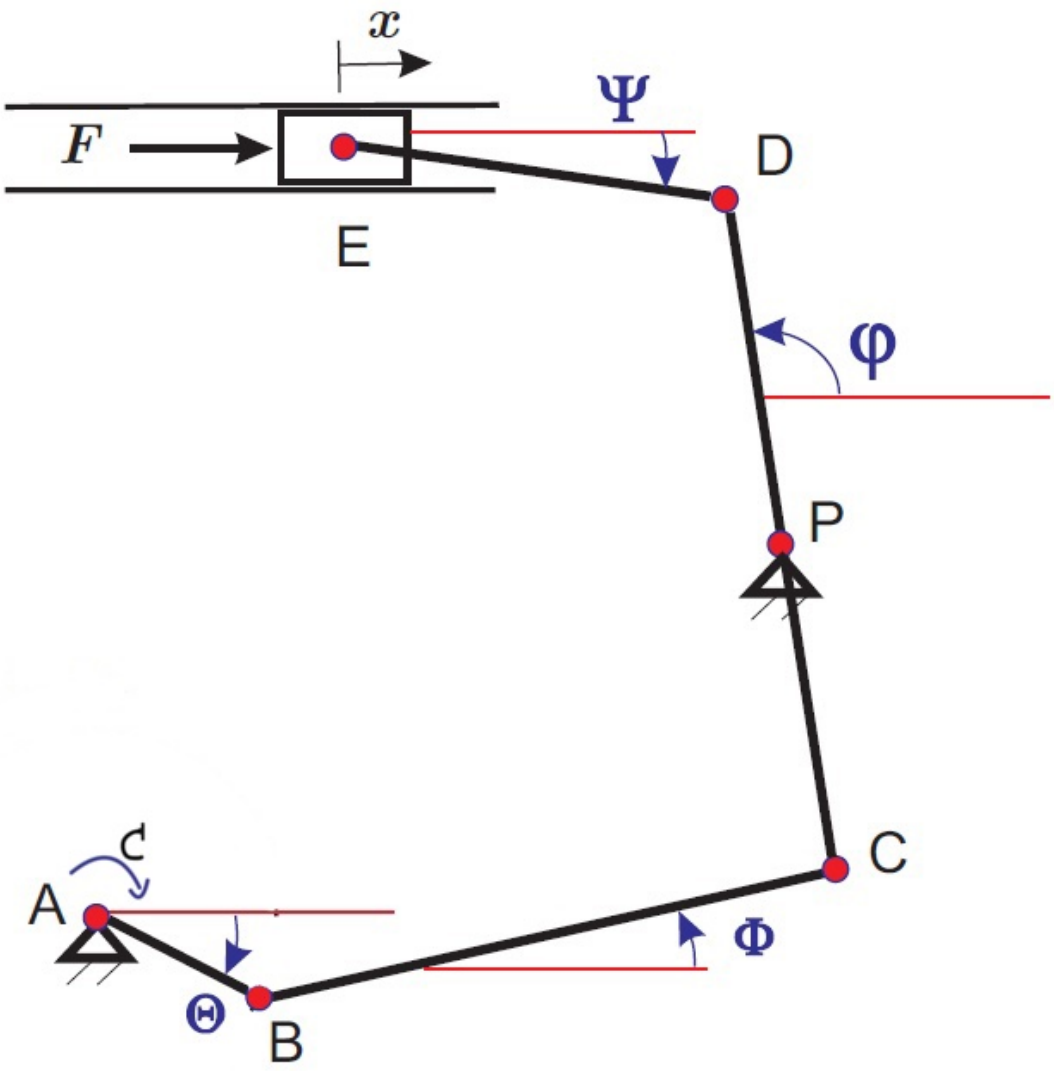

Figure 3: Crank and slider