

ME 380

Kinematics and Machine Dynamics

Homework V

1. [25 points] Perform position, velocity, and acceleration analysis for the mechanism depicted in Figure 1 using analytical vector methods. Assume $\omega_1 = 5 \frac{\text{rad}}{\text{s}}$ and $\alpha_1 = 2 \frac{\text{rad}}{\text{s}^2}$.

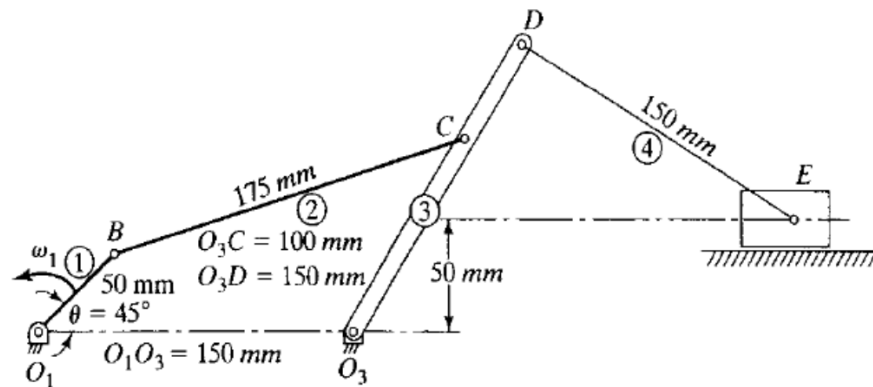


Figure 1: Fourbar with slider

2. [25 points] Perform position and velocity analysis for the mechanism depicted in Figure 2 using analytical vector methods. Assume $\omega_1 = 20 \frac{\text{rad}}{\text{s}}$ (the only nonzero component of the angular velocity of the cylinder with respect to the fixed frame).

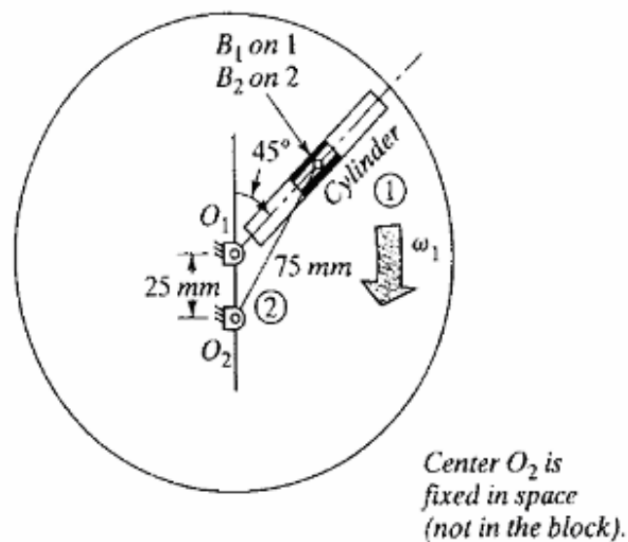


Figure 2

3. [25 points] Perform position, velocity, and acceleration analysis for the mechanism shown in Figure 3 using analytical vector methods. Take $\theta_1 = 20^\circ$, $\omega_1 = \frac{1}{2} \frac{\text{rad}}{\text{s}}$ and $\alpha_1 = 1 \frac{\text{rad}}{\text{s}^2}$.

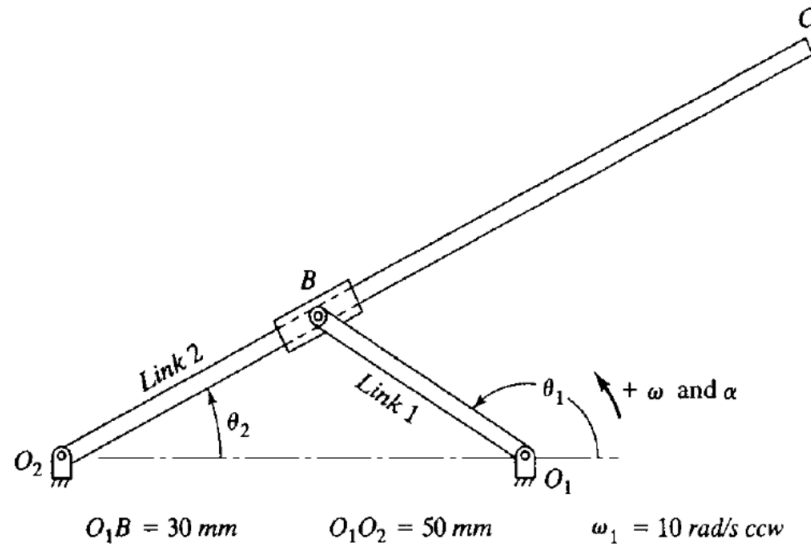


Figure 3

4. [25 points] Derive forward and inverse kinematic equations (at position- and velocity-level) for the pantograph mechanism presented in Figure 4, using analytical vector methods. Feel free to define any variables required for the solution. Make sure to clearly mark your definitions on the figure and be consistent with your notation.

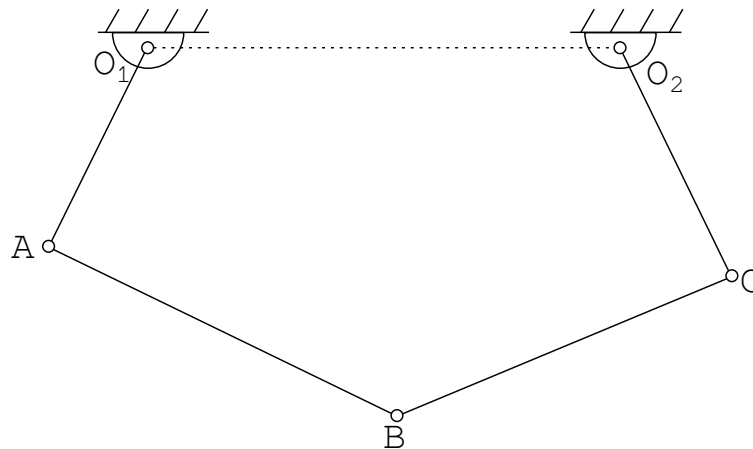


Figure 4: Pantograph