ME 380
Kinematics and Machine Dynamics
Homework IV

1. [15 points] Consider the double-slider two-loop linkage illustrated in Figure 1, where $l_1 = 1.3$, $l_2 = 5.2$, $l_F = 5$, $l_{DE} = 4.5$, $l_{CD} = 1.5$, and $\theta_1 = \frac{\pi}{6}$. Find θ_2, θ_3, l_D, and l_E in two steps.

   1. Analytically derive the loop equations,
   2. Use numerical techniques to get a numerical solution.

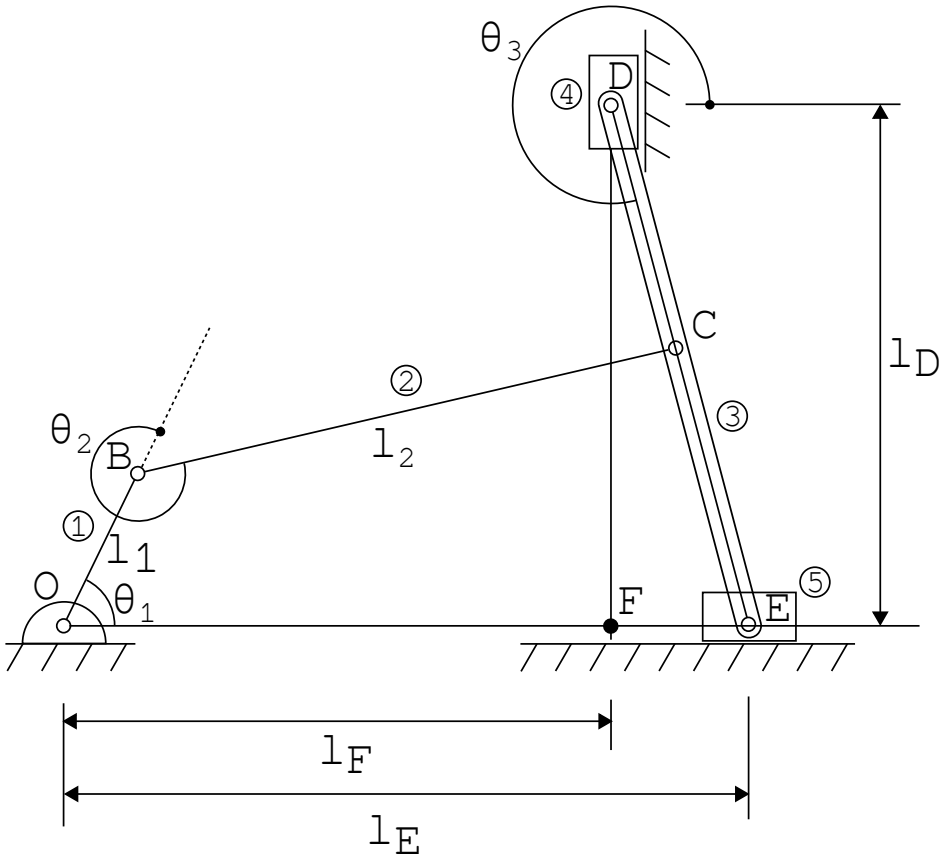

Figure 1: `Double-slider two-loop linkage`

2. [15 points] Referring to Figure 2, let $l_1 = 35$, $l_0 = 50$, $\omega_1 = 7.5\ \frac{rad}{s}$. and $\theta_1 = \frac{\pi}{10}$. Find

   a) l_2
   b) θ_2
   c) ω_2

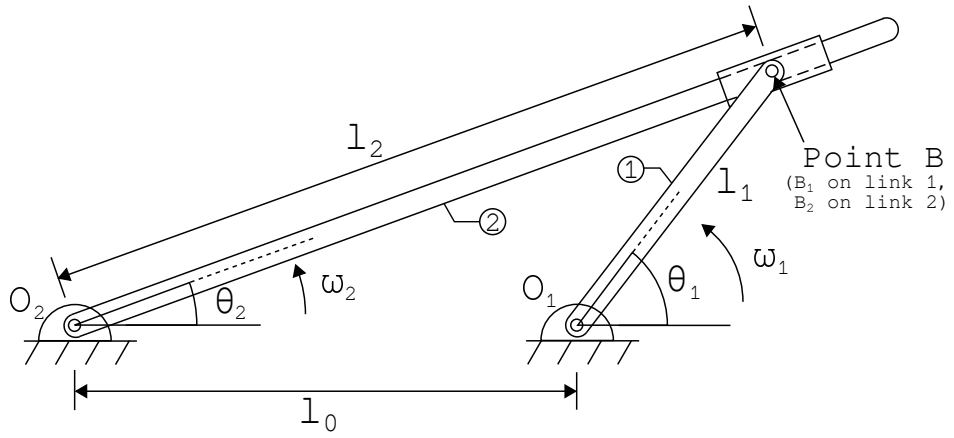

Figure 2: `Sliding contact linkage`

3. [15 points] Referring to Figure 3, let $l_0 = 30$, $l_1 = 15$, $l_2 = 35$, $l_3 = 20$, and $\theta_1 = \frac{\pi}{3}$. Calculate θ_2, θ_3, v_C, ω_2, and ω_3 for $\omega_1 = 20\ \frac{rad}{s}$.

4. [15 points] Plot $\frac{\omega_3}{\omega_1}$ versus θ_1 curve for the linkage depicted in Figure 3 if $\frac{l_0}{l_1} = 2$, $\frac{l_2}{l_1} = \frac{7}{3}$, and $\frac{l_3}{l_1} = \frac{4}{3}$.

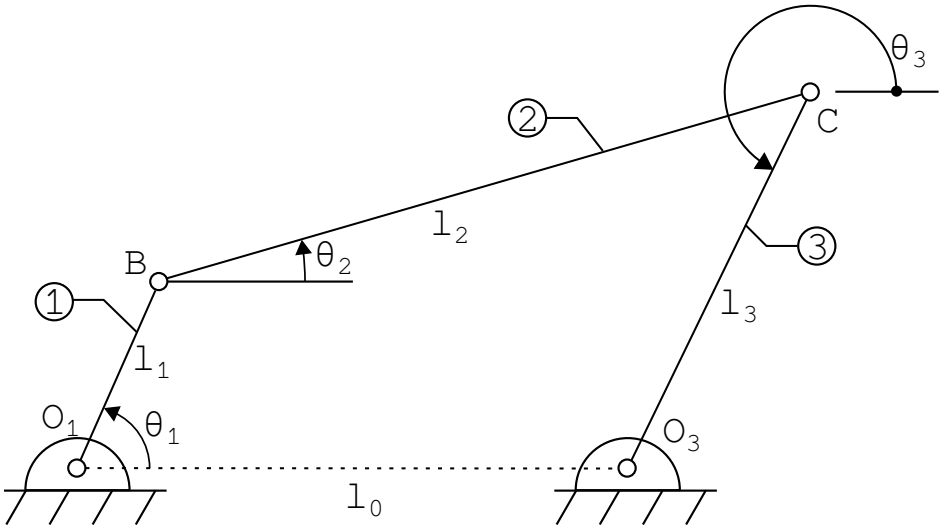

Figure 3: `Four-bar linkage`