

This is an in-class quiz from 9:20 AM to 9:50 AM.

Question 1 (2 points)

A crank pivoted to a frame is connected to two zero-free-length springs of linear stiffness. The spring constants are indicated in the figure as k_1 and k_2 . The distance between points A and B is l_1 and that between B and C is l_2 . The length of the crank is r . Derive a relationship among all the parameters so that this elastic system is in static equilibrium for any orientation of the crank.

- (i) Use the energy method to arrive at the relationship.
- (ii) And then show that the resultant of the two spring forces is aligned with the crank in all configurations when the relationship you derived in (i) is satisfied.
- (iii) Extra credit for commenting on the nature of static equilibrium (i.e., stable, unstable, or neutrally stable).

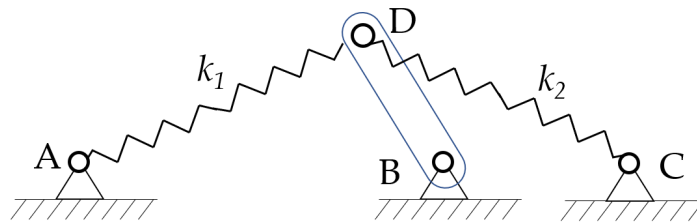


Fig. 1: Statically balanced two-spring-one-crank system