

Practice Problem Set 7: Engineering Mechanics (NMEC101)
Virtual Work and Stability of Equilibrium

Instruction: Figure numbers correspond to the problem numbers.

1. Knowing that the line of action of the force Q passes through point C , derive an expression for the magnitude of Q required to maintain equilibrium.
2. The mechanism shown is acted upon by the force P . Derive an expression for the magnitude of the force Q required for equilibrium.
3. A slender rod AB of mass m is attached to two blocks A and B which can move freely in the guides shown. Knowing that the spring is unstretched when $y = 0$, determine the value of y corresponding to equilibrium when $m = 12 \text{ kg}$, $l = 750 \text{ mm}$, and $k = 900 \text{ N/m}$.
4. A block of weight W is hung from member AB as shown. Neglecting the weight of AB and knowing that the spring is unstretched when $\theta = 20^\circ$, determine the value of θ corresponding to equilibrium when 6.6 N . $W = 6.6 \text{ N}$. State whether the equilibrium is stable, unstable, or neutral.
5. Spring AB of constant 2 kN/m is attached to two identical drums as shown. Knowing that the spring is unstretched when $\theta = 0$ and that $m = 20 \text{ kg}$, determine the values of θ less than 180° corresponding to equilibrium. State in each case whether the equilibrium is stable, unstable, or neutral.

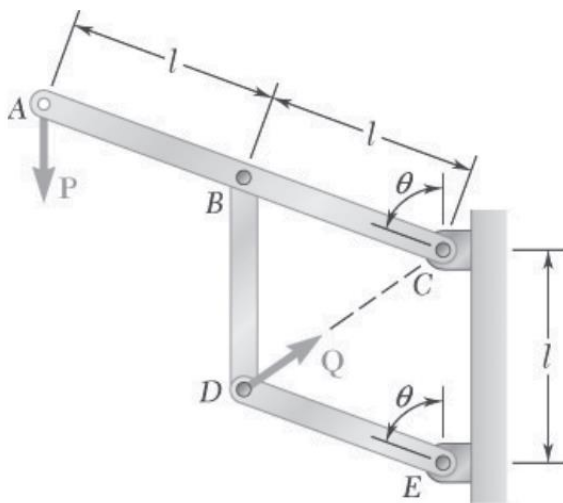


Fig. 1

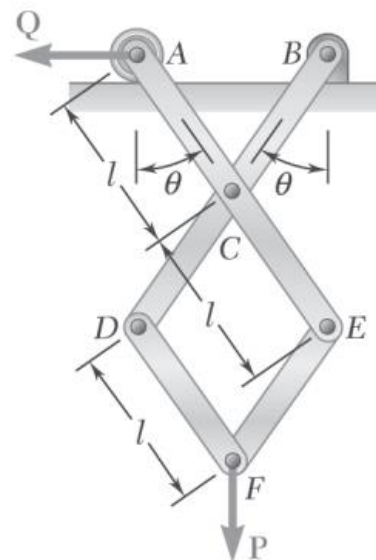


Fig. 2

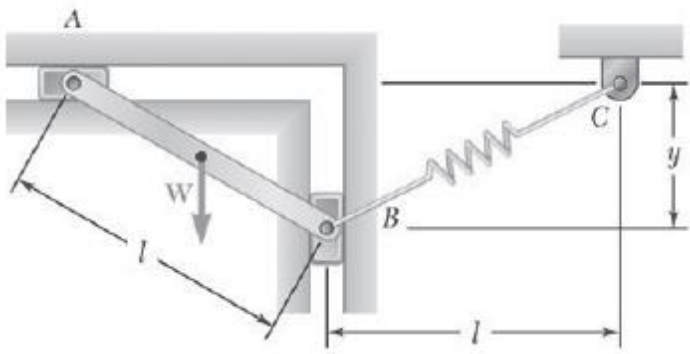


Fig. 3

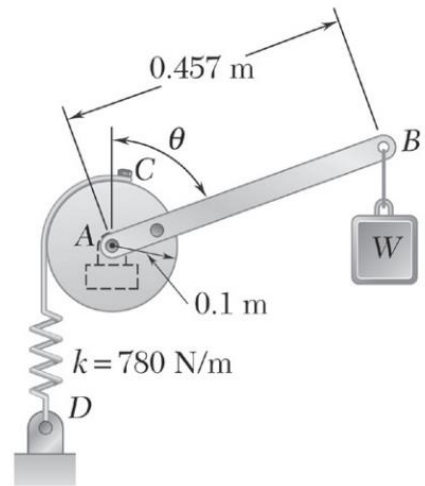


Fig. 4

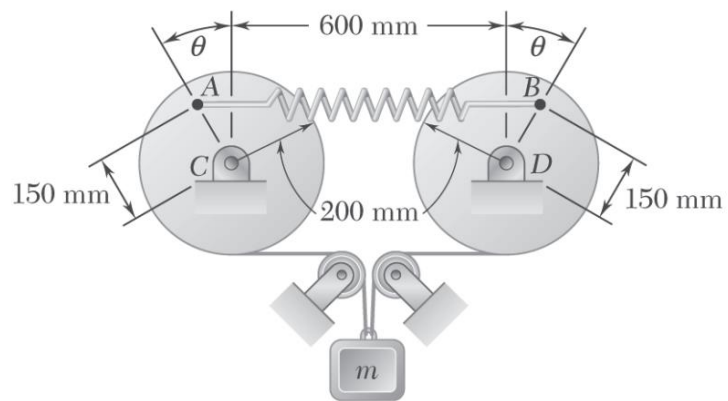


Fig. 5