

Assignment 1: Engineering Mechanics (NMEC101) (Session 2024-25)

Instruction: Figure numbers correspond to the problem numbers.

1. Three forces and a couple act on crank ABC . For $P = 25\text{ N}$ and $\alpha = 40^\circ$, (a) determine the resultant of the given system of forces, (b) locate the point where the line of action of the resultant intersects a line drawn through point B and C . (c) locate the point where the line of action of the resultant intersects a line drawn through points A and B .
2. A piece of sheet metal is bent into the shape shown and is acted upon by three forces. Replace the three forces with an equivalent wrench and determine (a) the magnitude and direction of the resultant \mathbf{R} , (b) the pitch of the wrench, (c) the point where the axis of the wrench intersects the yz plane.
3. A hand truck is used to move two barrels, each weighing 160 N . Neglecting the weight of the hand truck, determine (a) the vertical force \mathbf{P} which should be applied to the handle to maintain equilibrium when $\alpha = 35^\circ$, (b) the corresponding reaction at each of the two wheels.
4. Rod ABC is bent in the shape of a circular arc of radius R . Determine (a) the value of θ so that the magnitudes of the reactions at B and C are equal, (b) the corresponding reactions at B and C .
5. A vertical load \mathbf{P} is applied at end B of rod BC . The constant of the spring is k , and the spring is unstretched when $\theta = 90^\circ$. (a) Neglecting the weight of the rod, express the angle θ corresponding to equilibrium in terms of P , k , and l . (b) Determine the value of θ corresponding to equilibrium when $P = \frac{1}{4}kl$
6. Using the method of joints determine the force in each member of the truss shown. State whether each member is in tension or compression.
7. For the given loading, determine (only through inspection) the zero-force members in the truss shown.
8. A roof truss is loaded as shown. Determine the force in members CE , DE , and EF .
9. For the frame and loading shown, determine the components of all forces acting on member $GBEH$.
10. Knowing that the pulley has a radius of 75 mm , determine the components of the reactions at A and B .

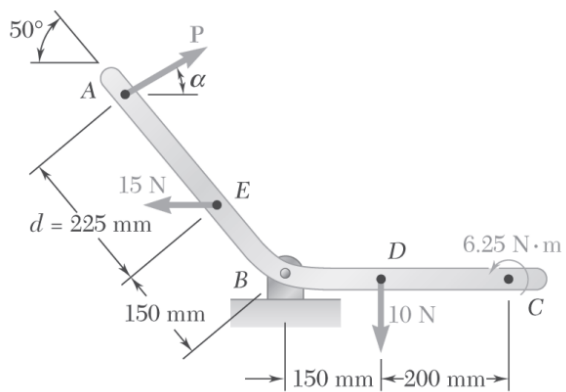


Fig. 1

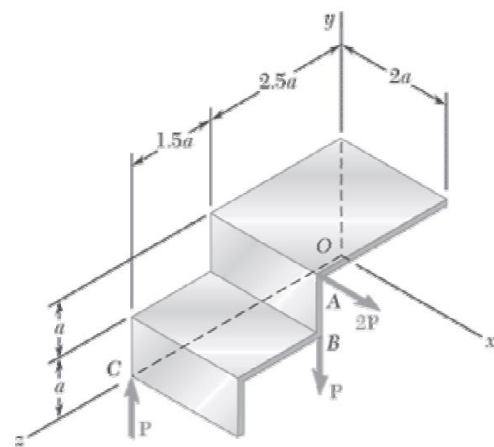


Fig. 2

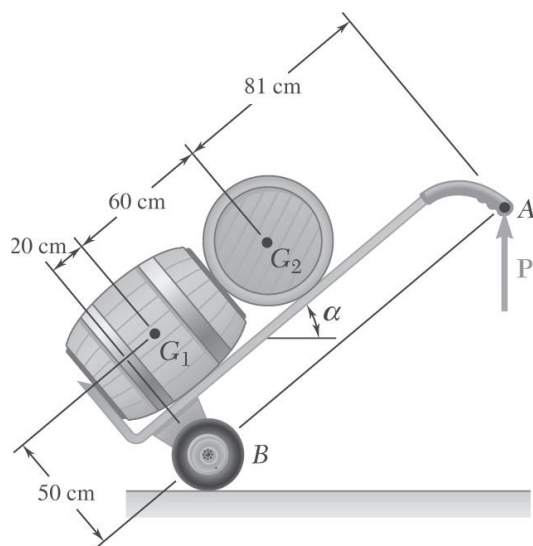


Fig. 3

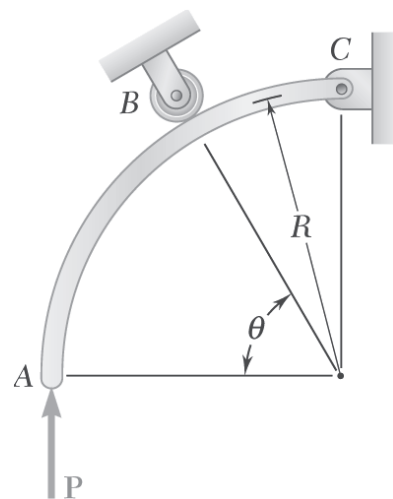


Fig. 4

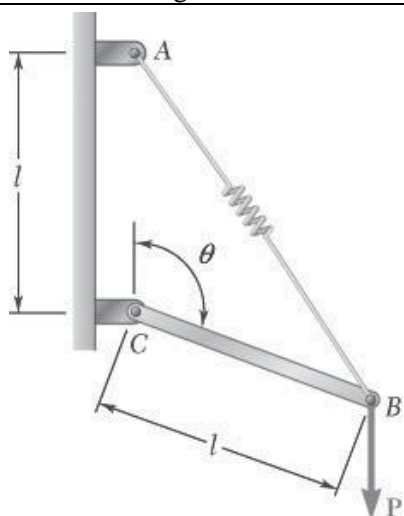


Fig. 5

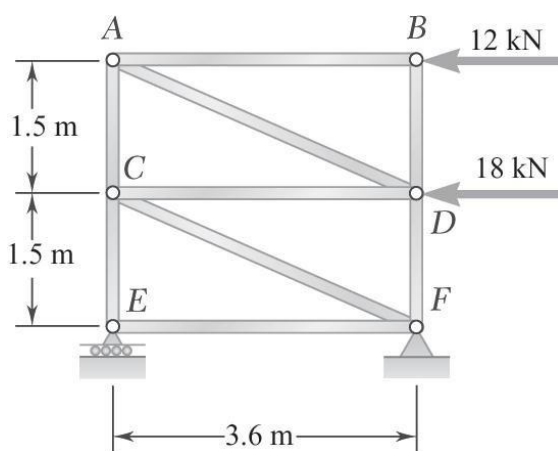


Fig. 6

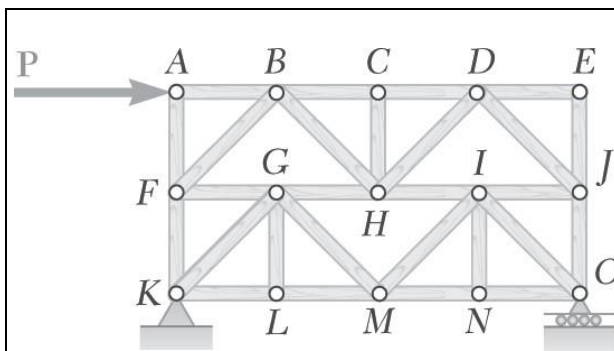


Fig. 7

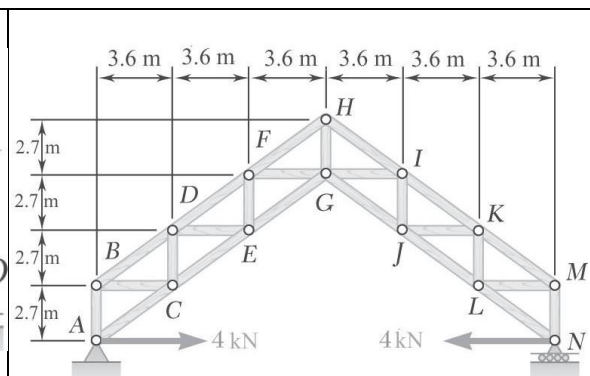


Fig. 8

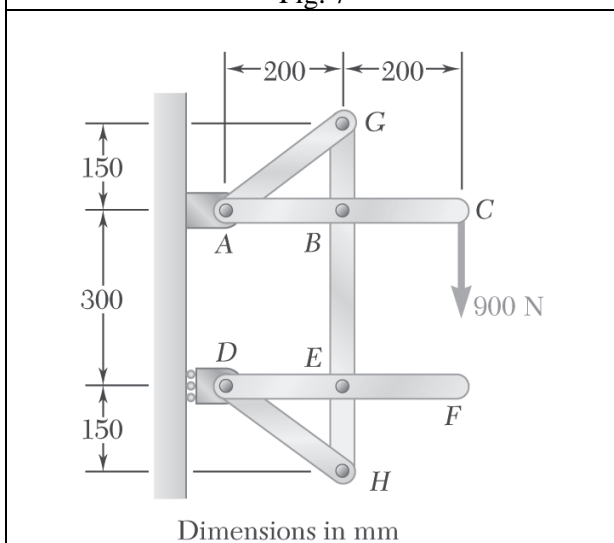


Fig. 9

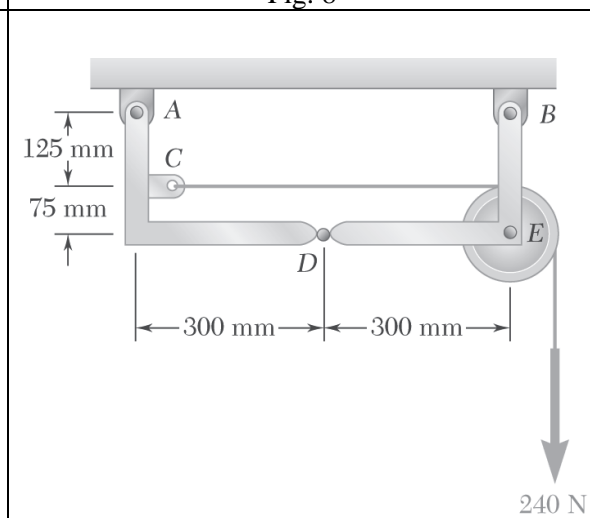


Fig. 10