Chapter 12 (Static Equilibrium & Elasticity)

1- In the Figure 1, one ends of a uniform beam that weight 222 N is attached to a wall with hinge. The other end is supported by a wire. If you know that angle A is equal to angle B which is 30°, find the tension, and the net force on the beam from the hinge. (A: 192.3 N, 116.3 N)

2- A uniform ladder (length = 5.00 m, mass = 20.0 kg) is leaning against a frictionless wall at an angle of 53 deg above the horizontal. A 40.0 kg boy climbs 2.00 m up the ladder (see Figure 2). What is the magnitude of the friction force exerted on the ladder by the floor? (A: 192 N)

3- Figure 3 shows a uniform horizontal beam (length = 10 m, mass = 25 kg) that is pivoted at the wall, with its far end supported by a cable that makes an angle of 50 deg with the horizontal. If a person (mass = 60 kg) stands 3.0 m from the pivot, what is the tension in the cable? (A: 390 N)

4- A uniform beam has a weight of 120 N and is supported as shown in Figure 4. What is the magnitude of the force by the pin on the beam? (A: 75 N)

5- A traffic light hangs from a structure as shown in Figure 5. The uniform rod AB is 4.5 m long and has a mass of 5.0 kg. The mass of the traffic light is 10.0 kg. Determine the tension in the horizontal massless cable CD. (A: 121 N)

6- A 300.0-kg mass is hanged from the end of a steel wire attached to the ceiling. The steel wire is 43.0 cm long, 2.00 mm in radius and has negligible mass. Calculate the change in the length of the wire (Young's modulus of the steel E = 2.00×10^{11} N/m^2). (A: 0.50 mm)

7- A solid copper cube has an edge length of 85.5 cm. How much pressure (in N/m^2) must be applied to the cube to reduce the edge length to 85.0 cm? The bulk modulus of copper is 1.4×10^{11} N/m^2. (A: 2.44×10^9 N/m^2)

8- A cylindrical copper wire 1.0 m long has a cross-sectional diameter of 2.0 mm. Under what tension does it stretch by 1.0 cm? (Young's modulus of copper is Y= 1.1×10^{11} N/m^2) (A: 3456 N)

Fig. 1
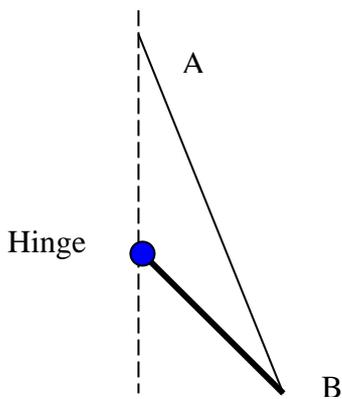
Fig. 2
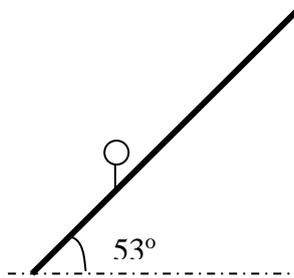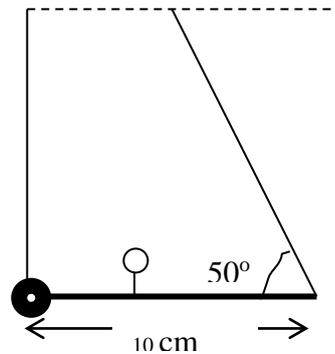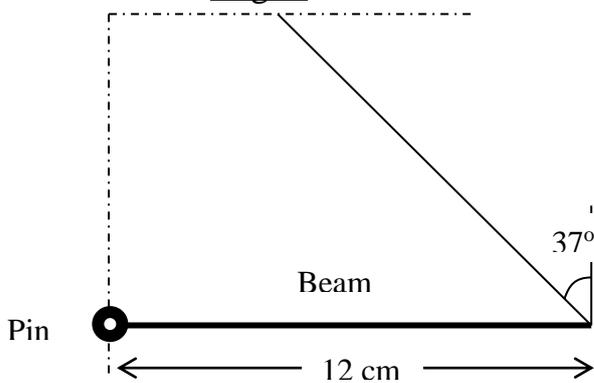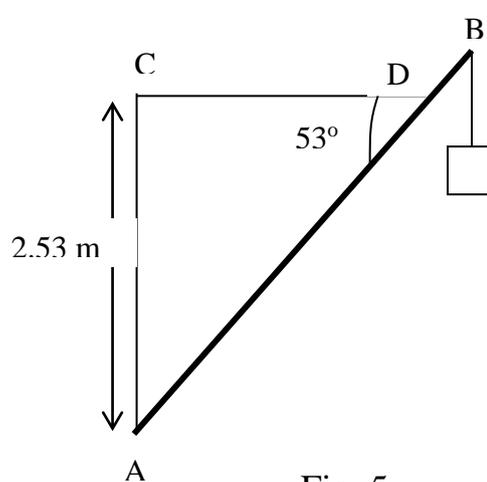
Fig. 3

Fig. 4

Fig. 5

Summary of Chapter 12 topics

1- Understanding the Equilibrium, Examples of Static.

2- Understanding the Elasticity.