

**Chapter # 13 (Static Equilibrium & Elasticity)**

1- A 1200 N uniform beam is supported by a cable as in Fig 1. The beam is pivoted at the bottom point O. Find the tension in the cable. [338 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 Fig (2)). What is the magnitude of the friction force exerted on the ladder by the floor? [192 N]

3- Fig (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? [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 ? [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. [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  $E = 2.00 \times 10^{11} \text{ N/m}^2$ ). [0.50 mm]

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

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  $Y = 1.1 \times 10^{11} \text{ N/m}^2$ ) [3456 N]

9- A window washer attempts to lean a ladder against a frictionless wall. He finds that the ladder slips on the ground when it is placed at an angle of less than  $75^\circ$  to the ground but remains in place when the angle is greater than  $75^\circ$ . The coefficient of static friction between the ladder and the ground is: [0.13]

