1. Two cables each with a cross-sectional area A support a force P as shown in Fig. 1. Each cable is of length L and modulus of elasticity of E. Determine the deflection of point C. **(10%)**

2. A step shaft transmits a torque of 10000 lb-in as shown in Fig. 2. Determine the maximum shear stress and the relative angle of twist between surfaces located at points A and D. (E = 30 x 10^6 psi, v = 0.3) **(15%)**

3. The simply supported beam in Fig. 3 is subjected to two concentrated forces as shown. The material is steel having a working stress in tension or compression of 180 MPa, and the cross section is rectangular with the height being 1.75 times the width. Determine the width of the beam necessary to support the loads. **(25%)**

4. For the clamped-simply supported beam shown in Fig. 4, choose the moment at A as the redundant and use integration of EIv'' = M to determine the reactions and the expression for the displacement. **(25%)**

5. Fig. 5 shows a 30-mm solid round shaft supported by self-aligning bearings at A and B (i.e., considered as simply supported). Attached to the shaft are two chain sprockets that are loaded as shown. Identify the specific shaft location subjected to the most severe state of stress and determine the principal stresses and maximum shear stress at this particular position. In addition, represent the stress state at this point in terms of a Mohr circle plot. Note that the transverse shear stress can be reasonably neglected. **(25%)**
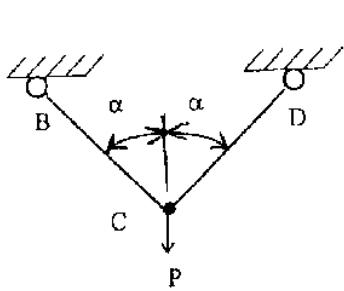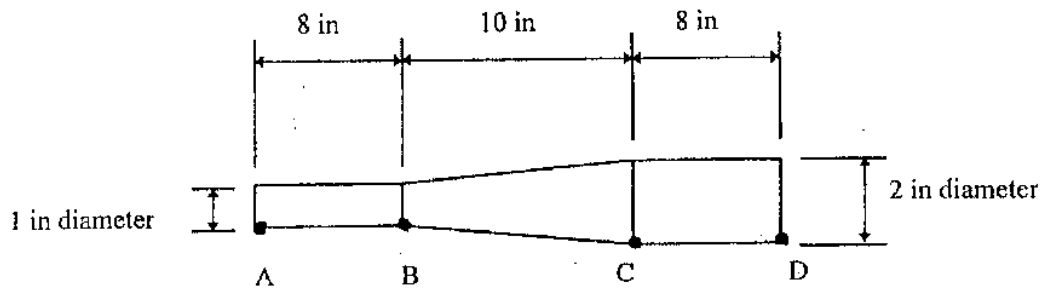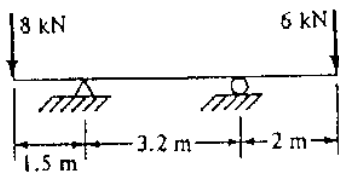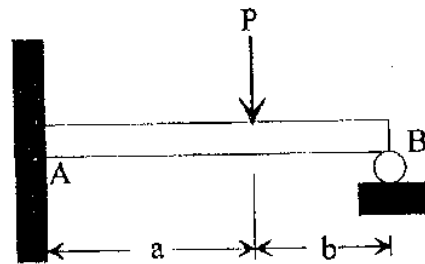
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5