系所別: 機械工程學系　甲組　科目: 材料力學

1. The solid steel (G = 80 GPa) shaft shown in **Fig. 1** is fixed to the wall at C. The bolt holes in the flange at A have an angular misalignment of 0.0018 rad. with respect to the holes in the wall. Determine
   (a) The torque, applied at B, required to align the bolt holes. **(6%)**
   (b) The maximum shearing stress in the shaft after the bolts are inserted and tightened and the torque at B is removed. **(9%)**
   (c) The maximum torque that can be applied at section B after the bolts are tightened if the maximum shearing stress in the shaft is not to exceed 70 MPa. **(10%)**

2. Draw complete shear force and bending moment diagrams for the two simply supported beams shown in **Figs. 2(a)** and **2(b)**, respectively. Note that M_o is a concentrated couple, P is a concentrated force, and W is the intensity of a uniformly distributed line load. **(25%)**

3. A beam is loaded and supported as shown in **Fig. 3**. Note that w is the intensity of a uniformly distributed line load and E and I are constant for the entire beam. Determine
   (a) The reactions at supports A, B, and C. **(10%)**
   (b) The bending moment over the middle support, M_B. **(5%)**
   (c) The deflection at the middle of span BC. **(10%)**

4. Three forces are applied to the machine component ABD as shown in **Fig. 4**. Knowing that the cross section containing point H is a 20x40-mm rectangle, determine the principal stresses at point H. **(25%)**

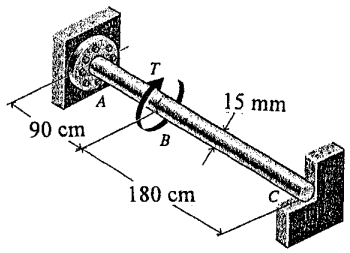

Fig. 1

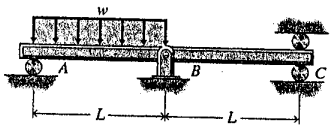

Fig. 3

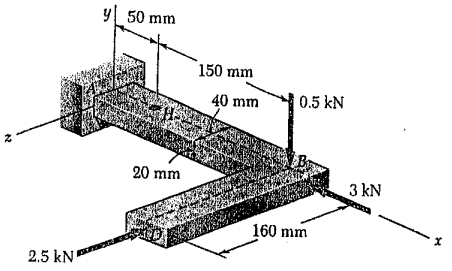

Fig. 4

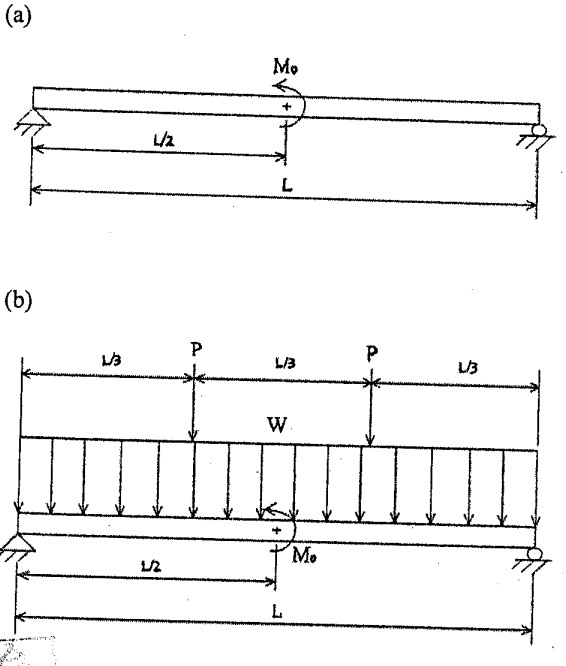

Fig. 2