太試題雙面印刷

Page 1

1. A punch for making holes in steel plates is shown in Fig. 1. Assume that a punch having diameter d = 10 mm is used to punch a hole in an 4-mm plate.　If a force P =100 kN is required to create the hole, what are the average shear stress in the plate and the average compressive stress in the punch? (15%)
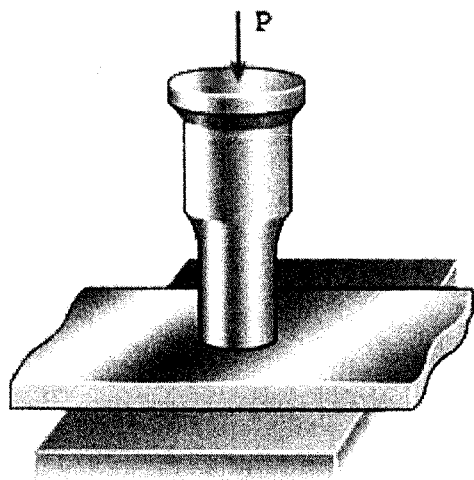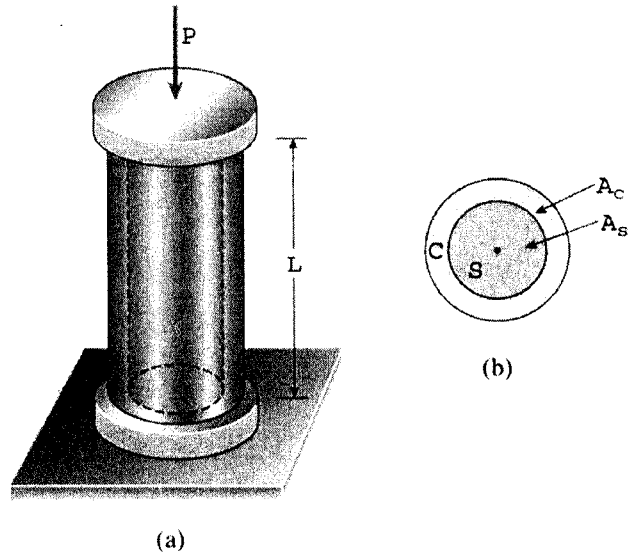

Fig. 1　　　　　　　　　　　　　　　　Fig. 2

2. A solid circular steel cylinder S is encased in a hollow circular copper tube C (see Fig. 2). The cylinder and tube are compressed between the rigid plates of a testing machine by compressive forces P =40 kN. The steel cylinder has diameter d_S=45 mm and modulus of elasticity E_S=200 GPa, the copper tube has diameter d_C=60 mm and modulus E_C=120 GPa, and both parts have length L=200 mm. Determine the following quantities: (a) the corresponding compressive stresses σ_S and σ_C; and (b) the shortening δ of the assembly. (15%)

3. A solid steel shaft ABC of 50 *mm* diameter (Fig. 3) is driven at A by a motor that transmits 60kW to the shaft at 10Hz.　The gears at B and C drive machinery requiring power equal to 40kW and 20kW, respectively.　Compute the maximum shear stress τ_{max} in the shaft and the angle of twist Φ_{AC} between the motor at A and the gear at C. (Use G=80GPa) (20%)
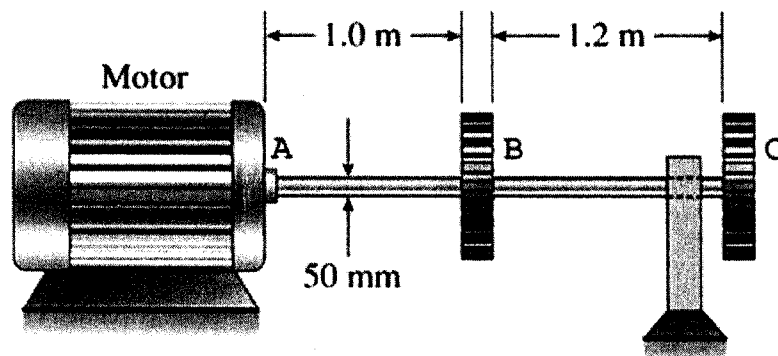

Fig. 3

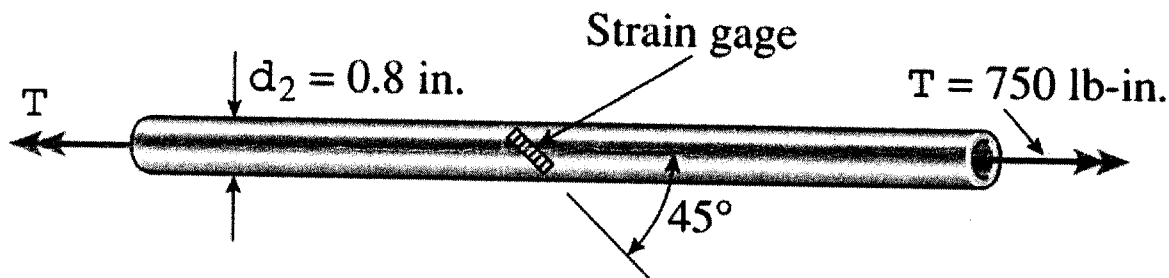系別：機械與機電工程學系　　　　科目：材　料　力　學

考試日期：2月26日(星期日) 第2節　　　　本試題共 6 大題， 2 頁

4. The normal strain in the 45° direction on the surface of a circular tube (see Fig. 4) is 880×10^{-6} when the torque $T = 750$ lb-in. The tube is made of copper alloy with $G = 6.2 \times 10^6$ psi. If the outside diameter d_2 of the tube is 0.8 in., what is the inside diameter d_1? (15%)

Fig. 4

5. A beam with span L=3 ft shown in Fig. 5 is simply supported at point A and B. The uniform load on the beam (including its own weight) is q=160 lb/in. The cross section of the beam is rectangular with width b=1 in. and height h=4 in. The beam is adequately supported against sideways buckling. Determine the normal stress σ_C and shear stress τ_C at point C. (15%)

Fig. 5
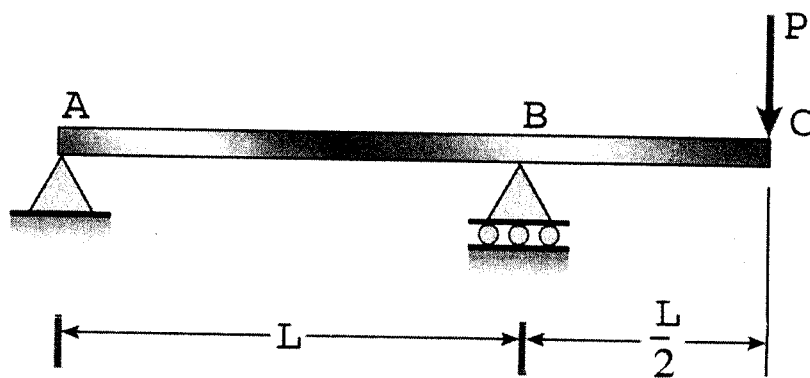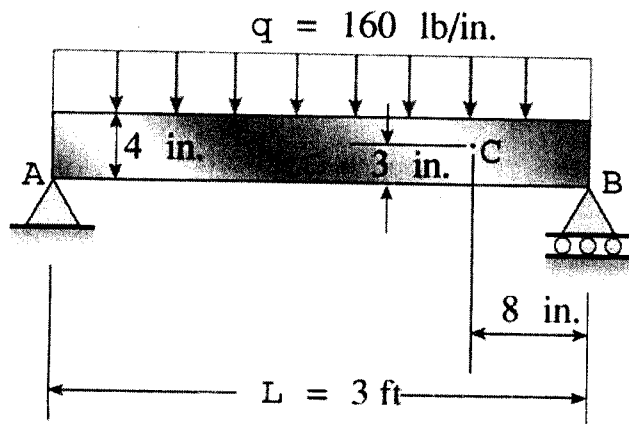
Fig. 6

6. A simple beam *AB* with an overhang *BC* supports a concentrated load *P* at the end of the overhang (see Fig. 6). The main span of the beam has length *L* and the overhang has length *L/2*. Determine the equations of the deflection curve and the deflection δ_C at the end of the overhang. (*note*: The beam has constant flexural rigidity *EI*) (20%)