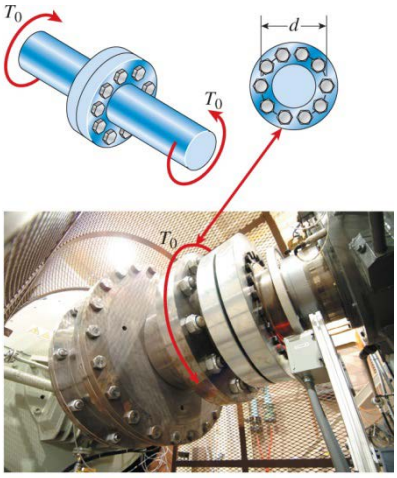
材料力學　作業 2

學號：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿姓名：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

1.8-2 A torque T_0 is transmitted between two flanged shafts by means of ten 20-mm bolts (see figure and photo). The diameter of the bolt circle is $d = 250mm$.

If the allowable shear stress in the bolts is 85 MPa, what is the maximum permissible torque? (Disregard friction between the flanges.)

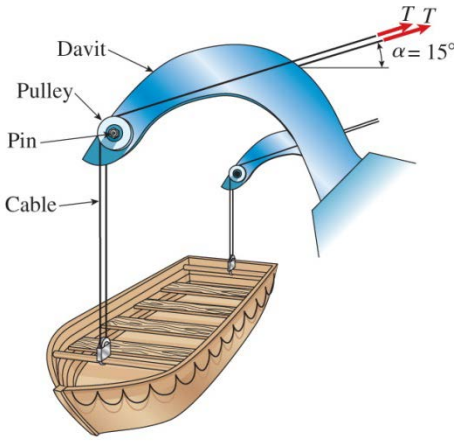


Drive shaft coupling on a ship propulsion motor (Courtesy of American Superconductor)

1.8-7 A lifeboat hangs from two ship's davits, as shown in the figure. A pin of diameter $d = 20mm$ passes through each davit and supports two pulleys, one on each side of the davit.

Cables attached to the lifeboat pass over the pulleys and wind around winches that raise and lower the lifeboat. The lower parts of the cables are vertical and the upper parts make an angle $\alpha = 15^0$ with the horizontal. The allowable tensile force in each cable is 8 kN, and the allowable shear stress in the pins is 27.5 MPa.

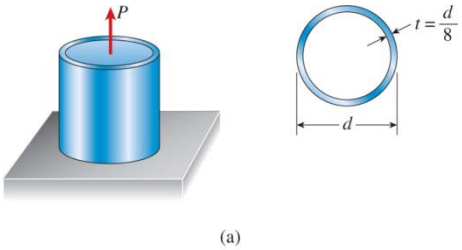
If the lifeboat weighs 6.7 kN, what is the maximum weight that should be carried in the lifeboat?



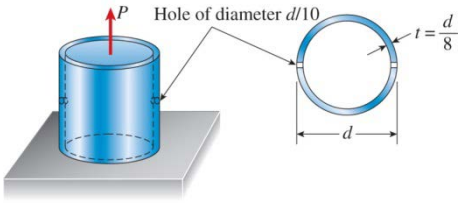
1.9-2 A copper alloy pipe having yield stress $\sigma_{\gamma} = 290$ MPa is to carry an axial tensile load $P = 1500$ kN (see figure part (a)). A factor of safety of 1.8 against yielding is to be used.

(a) If the thickness t of the pipe is to be one-eighth of its outer diameter, what is the minimum required outer diameter $d_{\min}$?

(b) Repeat part (a) if the tube has a hole of diameter $d/10$ drilled through the entire tube as shown in the figure [part (b)] .



(a)



1.9-12 A steel column of hollow circular cross section is supported on a circular steel base plate and a concrete pedestal (see figure). The column has outside diameter $d = 250$ mm and supports a load $P = 750$ kN.

(a) If the allowable stress in the column is 55 MPa, what is the minimum required thickness t? Based upon your result, select a thickness for the column. (Select a thickness that is an even integer, such as 10, 12, 14, . . . , in units of millimeters.)

(b) If the allowable bearing stress on the concrete pedestal is 11.5 MPa, what is the minimum required diameter D of the base plate if it is designed for the allowable load P_{allow} that the column with the selected thickness can support?