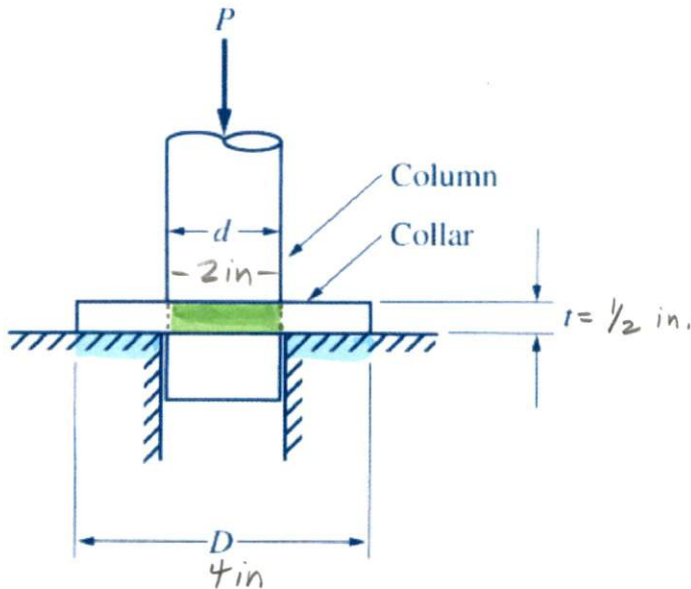9-23

In the collar bearing shown in Fig. P9-23, the average bearing stress between the collar and the support is known to be 4000 psi. If d = 2 in., D = 4 in., and t = ½ in., determine (a) the load P applied to the column and (b) the average shear stress on the area between the collar and the column.

Solution.

(a) $\sigma_b = \dfrac{P}{A_b}$

$A_b =$ Area Collar $-$ area Column

$= \dfrac{\pi \; 4in^2}{4} - \dfrac{\pi \; 2in^2}{4}$

$= 12.566\,in^2 - 3.1416\,in^2$

$= 9.42 \; in.^2$

$P = \sigma_b \, A_b$

$= \dfrac{4000 \; lb}{in^2} \times 9.42\,in^2 = \underline{\underline{37\,700 \; lb}}$

(b) $\tau_{avg} = \dfrac{P}{A_s} = \dfrac{37.7 \; Kips}{\pi \, (2\,in.)\,(½\,in.)}$

$= \underline{\underline{12.0 \; ksi}}$