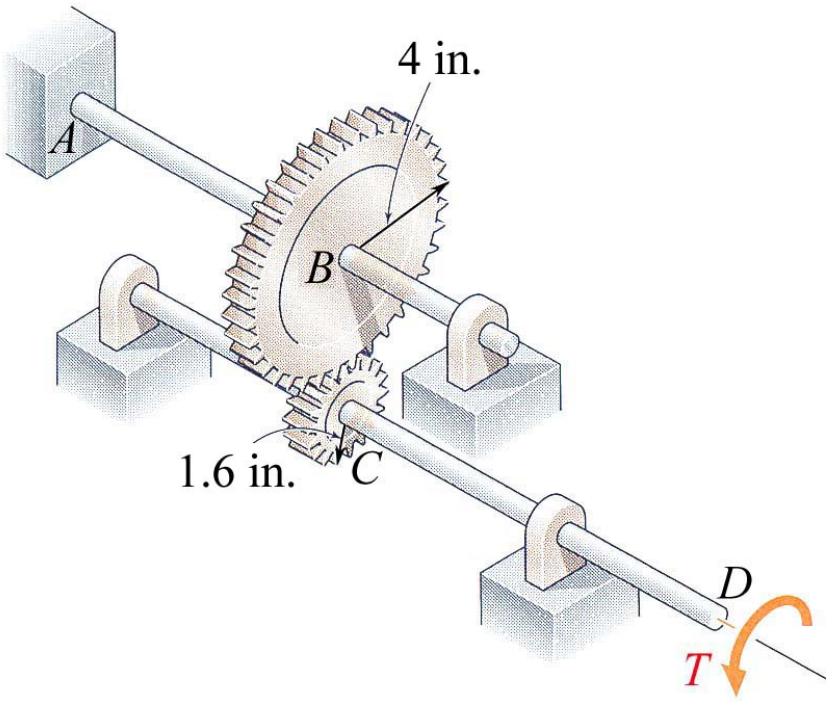
MEEG 3013 Quiz #3.m07.072

A torque $T = 12$ kip·in. is applied at D as shown. If diameters of the shafts are $d_{AB} = 2.25$ in. and $d_{CD} = 1.75$ in., determine the maximum shearing stress in (*a*) shaft *AB*, (*b*) shaft *CD*.



$T_{CD} = 12\times10^3$ lb·in. $\quad 12\times10^3 = 1.6F \quad F = 7500$ lb ②

$T_{AB} = 4F \quad T_{AB} = 30\times10^3$ lb·in. ② $\quad \tau_{\max} = \dfrac{Tc}{J}$

(*a*) Shaft *AB*

$$\tau_{\max} = \frac{T_{AB}(d_{AB}/2)}{J_{AB}} = \frac{30\times10^3(2.25/2)}{(\pi/2)(2.25/2)^4} = 13413.55$$

$\tau_{\max} = 13.41$ ksi ③

(*b*) Shaft *CD*

$$\tau_{\max} = \frac{T_{CD}(d_{CD}/2)}{J_{CD}} = \frac{12\times10^3(1.75/2)}{(\pi/2)(1.75/2)^4} = 11403.47$$

$\tau_{\max} = 11.40$ ksi ③