K. Dennehy Ch. 5, Pgs. 199-205: 5-3, 5-9, 5-23 HW

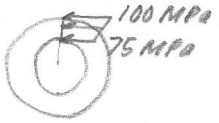
5-3

$$\tau_{max} = \frac{Tc}{J}$$

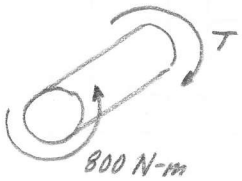
$$T_{max} = \tau_{max}\frac{J}{c} = \tau_{max}\frac{\frac{\pi}{2}c^4}{c}$$

$$T_{max} = \left(100\times10^3\ \frac{kN}{m^2}\right)\frac{\pi}{2}(0.050m)^3 = 19.63\ kN\text{-}m \text{ or } \boxed{19.6\ kN\text{-}m}$$

$$T_{,max} = \left(100\times10^3\ \frac{kN}{m^2}\right)\frac{\frac{\pi}{2}\left((0.050m)^4-(0.0375m)^4\right)}{(0.050m)} = 13.42\ kN\text{-}m \text{ or } \boxed{13.4\ kN\text{-}m}$$



5-9

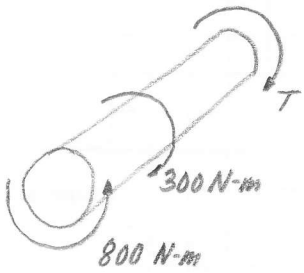


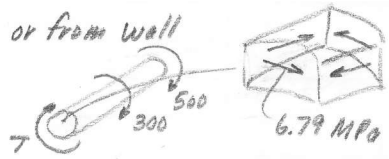
$\Sigma M = 0,\ 800\ N\text{-}m - T = 0$

$T = 800\ N\text{-}m$

$$\tau_B = \frac{T\rho}{J} = \frac{(800\ N\text{-}m)(0.020m)}{\frac{\pi}{2}(0.035m)^4}$$

$$\tau_B = 6.788\times10^6\ \frac{N}{m^2} \text{ or } \boxed{6.79\ MPa}$$





$\Sigma M = 0,\ 800\ N\text{-}m - 300\ N\text{-}m - T = 0$

$T = 500\ N\text{-}m$

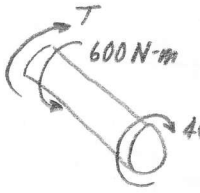
$$\tau_A = \frac{T\rho}{J} = \frac{(500N\text{-}m)(0.035m)}{\frac{\pi}{2}(0.035m)^4}$$

$$\tau_A = 7.424\times10^6\ \frac{N}{m^2} \text{ or } \boxed{7.42\ MPa}$$

5-23

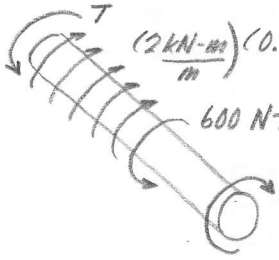
$\Sigma M = 0,\ -400\ N\text{-}m + T = 0$

$T = 400\ N\text{-}m$



$\Sigma M = 0,\ -400\ N\text{-}m + 600\ N\text{-}m - T = 0$

$T = 200\ N\text{-}m$



$\Sigma M = 0,\ -400\ N\text{-}m + 600\ N\text{-}m - 1.6\ kN\text{-}m + T = 0$

$T = 1.4\ kN\text{-}m$

$max\ T = 1.4\ kN\text{-}m$

$$\tau_{max} = \frac{Tc}{J} = \frac{T\rho}{\frac{\pi}{2}c^4}$$

$$1.6\times10^3\ \frac{kN}{m^2} = \frac{1.4\ kN\text{-}m}{\frac{\pi}{2}c^3}$$

$$c = 8.228\times10^{-2}\ m$$

$$d = 2c = 0.1646\ m \text{ or } \boxed{165\ mm}$$