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Cool! I'am really happy

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My friends are so mad that they do not know how I have all the high quality ebook which they do not!

#Diego Butler



so many fake sites. this is the first one which worked! Many thanks

8-47.  
The solid rod is subjected to the loading shown. Determine the state of stress at point A, and show the results on a differential element centered at the point.

**SOLUTION**  
Internal *Z* loading: Consider the equilibrium of the left segment of the rod being removed (Fig. a).  
 $\sum F_x = 0, \quad N_x - 100 = 0, \quad N_x = 100 \text{ kN}$   
 $\sum F_y = 0, \quad V_y - 10 = 0, \quad V_y = 10 \text{ kN}$   
 $\sum F_z = 0, \quad M_z - 20(10) = 0, \quad M_z = 200 \text{ kN}\cdot\text{m}$   
 $\sum M_x = 0, \quad T_x + 20(0.05) + 100(0.05) = 0, \quad T_x = -9.5 \text{ kN}\cdot\text{m}$   
 $\sum M_y = 0, \quad M_y + 20(2) + 100(0.05) = 0, \quad M_y = -7.00 \text{ kN}\cdot\text{m}$   
 $\sum M_z = 0, \quad M_z + 10(0) = 0, \quad M_z = -4.00 \text{ kN}\cdot\text{m}$   
 Section Properties for the circular cross section (Fig. b).  
 $A = \pi r^2 = \pi(0.05)^2 = 0.00785 \text{ m}^2$   
 $I_x = I_y = \frac{\pi}{4} r^4 = \frac{\pi}{4} (0.05)^4 = 0.262(10^{-7}) \text{ m}^4$   
 $J = \frac{\pi}{2} r^4 = \frac{\pi}{2} (0.05)^4 = 0.405(10^{-7}) \text{ m}^4$   
 $I_{yz} = -\frac{1}{12} \pi r^4 = -\frac{1}{12} \pi (0.05)^4 = -0.101(10^{-7}) \text{ m}^4$   
 $I_{yz} = 0$   
 Normal Stress For the assumed loading, the normal stress at point A can be determined from  

$$\sigma_x = \sigma_y = \frac{N_x}{A} + \frac{M_z y}{I_x} - \frac{M_y z}{I_y}$$

$$= \frac{100(10^3)}{0.00785} + \frac{(-4.00(10^3))(-0.05)}{0.262(10^{-7})} - \frac{(-7.00(10^3))(0)}{0.262(10^{-7})}$$

$$= 12.8(10^6) \text{ Pa} = 12.8 \text{ MPa (T)}$$
 Ans.  
 Shear Stress The transverse shear stress in *x* and *y* direction and the torsional shear stress can be obtained using the shear formula  $v_{xy} = \frac{V_y}{I_x} Q$  and the torsion formula  $v_{xz} = \frac{T_x}{J}$ , respectively.  
 $v_{xy} = \frac{V_y}{I_x} Q = \frac{10(10^3)}{0.262(10^{-7})} \left[ \frac{1}{2} r^2 y \right]_{y=0}^{y=0.05}$   

$$= \frac{10(10^3) (0.05)(0.05)}{0.262(10^{-7})} = 9.40(10^6) \text{ Pa}$$
 Ans.  
 $v_{xz} = \frac{T_x}{J} \rho = \frac{-9.5(10^3)}{0.405(10^{-7})} (0.05)$   

$$= -11.8(10^6) \text{ Pa} = -11.8 \text{ MPa}$$
 Ans.  
 $v_{xy} = v_{yx} = 0$   
 Using these results, the state of stress at point A can be represented by the differential volume element shown in Fig. c.  
 Ans.  
 $\sigma_x = 12.8 \text{ MPa (T)}$   
 $\tau_{xy} = 9.40 \text{ MPa}$   
 $\tau_{xz} = -11.8 \text{ MPa}$

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