

Torsion Problems

Do the following problems:

1. Problem 9.3.2

(a)

$$\tau_{\max} = \frac{3T}{2(1 + \pi)Rt^2}$$

$$\phi' = \frac{3T}{2(1 + \pi)GRt^3}$$

(b) ratio of stresses = 25.2

ratio of twists/l = 252

2. Problem 9.5.3 (use $J = 2\pi R^3 t$ for a closed thin tube)

$$R_0 = 3 m$$

3. Problem 9.5.7

$$F = \frac{Ts}{2\pi R^2}$$

4. Problem 9.6.3

Factor of increase = 200

5. Problem 9.6.4

$$q = 156.25 \text{ N/mm}$$

$$\phi' = 13.25 \times 10^{-6} \text{ rad/mm}$$

6. Problem 9.6.6

$$T = 48,700 \text{ N-mm}$$

$$\phi' = \frac{3.53}{G} \text{ rad/mm} \quad (G \text{ in MPa})$$

7. Problem 9.6.7

Stress and twist/length increase by about a factor of 1.78