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$$\text{MSS: } \sigma_1 - \sigma_3 = S_y/n \Rightarrow n = \frac{S_y}{\sigma_1 - \sigma_3}$$

$$\text{DE: } n = \frac{S_y}{\sigma'}$$

$$\sigma' = (\sigma_A^2 - \sigma_A\sigma_B + \sigma_B^2)^{1/2} = (\sigma_x^2 - \sigma_x\sigma_y + \sigma_y^2 + 3\tau_{xy}^2)^{1/2}$$

$$\text{(a) MSS: } \sigma_1 = 12, \sigma_2 = 6, \sigma_3 = 0 \text{ kpsi}$$

$$n = \frac{50}{12} = 4.17 \text{ Ans.}$$

$$\text{DE: } \sigma' = (12^2 - 6(12) + 6^2)^{1/2} = 10.39 \text{ kpsi, } n = \frac{50}{10.39} = 4.81 \text{ Ans.}$$

$$\text{(b) } \sigma_A, \sigma_B = \frac{12}{2} \pm \sqrt{\left(\frac{12}{2}\right)^2 + (-8)^2} = 16, -4 \text{ kpsi}$$

$$\sigma_1 = 16, \sigma_2 = 0, \sigma_3 = -4 \text{ kpsi}$$

$$\text{MSS: } n = \frac{50}{16 - (-4)} = 2.5 \text{ Ans.}$$

$$\text{DE: } \sigma' = (12^2 + 3(-8^2))^{1/2} = 18.33 \text{ kpsi, } n = \frac{50}{18.33} = 2.73 \text{ Ans.}$$

$$\text{(c) } \sigma_A, \sigma_B = \frac{-6 - 10}{2} \pm \sqrt{\left(\frac{-6 + 10}{2}\right)^2 + (-5)^2} = -2.615, -13.385 \text{ kpsi}$$

$$\sigma_1 = 0, \sigma_2 = -2.615, \sigma_3 = -13.385 \text{ kpsi}$$

$$\text{MSS: } n = \frac{50}{0 - (-13.385)} = 3.74 \text{ Ans.}$$

$$\text{DE: } \sigma' = [(-6)^2 - (-6)(-10) + (-10)^2 + 3(-5)^2]^{1/2}$$

$$= 12.29 \text{ kpsi}$$

$$n = \frac{50}{12.29} = 4.07 \text{ Ans.}$$

