Solutions

2.1

- $d = [\frac{16n}{\pi}(2K_f M_a/S_e + \sqrt{3}K_{fs}T_m/S_{ut})]^{1/3} = [\frac{32}{\pi}(2 \times 1.8 \times 90\,000/220 + \sqrt{3} \times 1.5 \times 250\,000/630)]^{1/3}$ (N · mm and MPa).
- $= [10.19 \times (1472.7 + 1031.0)]^{1/3} = \mathbf{29.4}$ mm.
- Choose the next standard size up: **30** mm.

2.2

- $L_{10} = (C/P)^3 \times 10^6/(60N) = (25.5/3.2)^3 \times 10^6/(60 \times 300) = \mathbf{28\,100}$ h.

3.1

- $L = 300 \times 60 \times 30\,000 = \mathbf{5.40 \times 10^8}$ rev.
- $C_{req} = P(L/10^6)^{1/3} = 3.2 \times 540^{1/3} = \mathbf{26.06}$ kN.
- The 6207's 25.5 kN falls short.
- 6208: $L_{10} = (30.7/3.2)^3 \times 10^6/18\,000 = \mathbf{49\,100}$ h.
- Its 40 mm bore needs 40 mm seats and a larger shoulder, so the shaft drawing (and its parameters) changes.

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