Stochastic Problems

6–64 Solve Prob. 6–1 if the ultimate strength of production pieces is found to be $\mathbf{S}ut = 1030\mathbf{LN}(1, 0.0508)$ MPa.

6–65 The situation is similar to that of Prob. 6–14 wherein the imposed completely reversed axial load $\mathbf{F}_a = 3.8\mathbf{LN}(1, 0.20)$ kip is to be carried by the link with a thickness to be specified by you, the designer. Use the 1020 cold-drawn steel of Prob. 6–14 with $\mathbf{S}ut = 68\mathbf{LN}(1, 0.28)$ and $\mathbf{S}yt = 57\mathbf{LN}(1, 0.058)$ kpsi. The reliability goal must exceed 0.99. Using the correlation method, specify the thickness t.

6–66 A solid round steel bar is machined to a diameter of 32 mm. A groove 3 mm deep with a radius of 3 mm is cut into the bar. The material has a mean tensile strength of 780 MPa. A completely reversed bending moment $M = 160$ N · m is applied. Estimate the reliability. The size factor should be based on the gross diameter. The bar rotates.

6–67 Repeat Prob. 6–66, with a completely reversed torsional moment of $T = 160$ N · m applied.

6–68 A $1\frac{1}{2}$-in-diameter hot-rolled steel bar has a $\frac{3}{16}$-in diameter hole drilled transversely through it. The bar is nonrotating and is subject to a completely reversed bending moment of $M = 1500$ lbf · in in the same plane as the axis of the transverse hole. The material has a mean tensile strength of 76 kpsi. Estimate the reliability. The size factor should be based on the gross size. Use Table A–16 for K_t.

6–69 Repeat Prob. 6–68, with the bar subject to a completely reversed torsional moment of 2000 lbf · in.

6–70 The plan view of a link is the same as in Prob. 6–30; however, the force F is completely reversed at 10.5 kip, the reliability goal is 0.998, and the material properties are $\mathbf{S}_{ut} = 64\mathbf{LN}(1, 0.045)$ kpsi and $\mathbf{S}_y = 54\mathbf{LN}(1, 0.077)$ kpsi. Treat F as deterministic, and specify the thickness h.