ASSIGNMENTS FOR MEEG 4103 Machine Element Design

TR 9:30 a.m. -10:50 a.m. Spring 2009

4103-001 LEC 9897 Machine Element Design
4103H-001 LEC 10315 HNRS Machine Element Design

Text: *Shigley's Mechanical Engineering Design, Eighth Edition*
R. G. Budynas and J. K. Nisbett, McGraw-Hill, 2008

Supplies: Calculator, engineering paper, mechanical pencil, eraser, *transparent* 6-in. plastic ruler, and compass or template for drawing circles.

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Part *B*

Chapter 6 6-2, 6-3, 6-4, 6-11, 6-12, 6-14

6S-1. Define all the symbols in the equation

$$\left(S'_f\right)_N = \sigma'_F \left(2N\right)^b$$

6S-2 Define all the symbols in the equation

$$\sigma'_F = \sigma_0 \, \varepsilon_F^m$$

6S-3 If σ_0, ε_F, and m are not known for steels with Brinell hardness number $H_B \le 500$, what is the SAE approximation for σ'_F in the equation in Prob. 6S-2?

6S-4 Draw schematically the *S*-*N* diagram (i.e., fatigue strength S_f versus number of stress cycles N) for ferrous metals and alloys, where the ranges for low cycle fatigue and high cycle fatigue must be labeled.

6S-5 For steels with tensile strength $S_{ut} \le 200$ kpsi, what is the estimated value of the endurance limit S'_e?

6S-6 In using the equation

$$S_f = a \, N^b$$

to estimate parameters in high cycle fatigue, show that

$$a = \frac{\left(f \, S_{ut}\right)^2}{S_e} \qquad\qquad b = -\frac{1}{3} \log\left(\frac{f \, S_{ut}}{S_e}\right)$$

6S-7 In computing the size factor k_b for a nonrotating round bar in bending with diameter d, show that the effective dimension d_e is given by

$$d_e = 0.370 \, d$$

6S-8 In computing the size factor k_b for a nonrotating rectangular section of dimension $h \times b$, show that the effective dimension d_e is given by

$$d_e = 0.808 \left(hb\right)^{1/2}$$