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| 6-17) The shaft shown in the figure is machined from **AISI 1040 CD steel.** The shaft **rotates at 1600 rpm** and is supported in rolling bearings at *A* and *B*. The applied forces **are *F*1 =2500 lbf** and ***F*2 = 1000 lbf**.  Determine the minimum **fatigue factor of safety** based on achieving infinite life. If infinite life is not predicted, estimate the number of cycles to failure. Also **check for yielding**. |  |

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| 6-20) A bar of steel has the minimum properties ***Se*  = 40 kpsi**, ***Sy*  = 60 kpsi**, and ***Sut*  = 80 kpsi**. The bar is subjected to a steady torsional stress of 15 kpsi and an **alternating bending stress of 25 kpsi**.  Find **the factor of safety** guarding against a static failure, and either the factor of safety guarding against a fatigue failure or the expected life of the part. For the fatigue analysis use:  (*a*) Modified Goodman criterion.  (*b*) Gerber criterion.  (*c*) ASME-elliptic criterion. |  |

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| 6-23) Repeat Prob. 6–20 but with an alternating **torsional stress of 15** kpsi and a steady **bending stress of 15 kpsi**. |  |