Homework

Known: D=in, Su = 110ksi, Sy = 77ksi, reversed bending, axial, torsional loading, steel, machined surface

Find: $S_n (6 \times 10^4$ life cycles)

**Endurance limits: (10^6 cycle strength)**

$$S_n = S_n' C_L C_G C_s$$

For bending,

$$S_n' = 0.5 S_u = \left(0.5(110) = 55\right) ksi \text{ (Fig. 8.5)}$$

$$C_L = 1$$ (Table 8.1)

$$C_G = 0.9$$ (Table 8.1)

$$C_S = 0.74$$ (Fig. 8.13)

$$S_n = (55)(1)(0.9)(0.74) = 36.6 ksi$$

0.9$S_u = \left(0.9(110) = 99.0\right) ksi \text{ (Table 8.1)}$

For axial,

$$S_n' = 55 ksi$$

$$C_L = 1$$

$$C_G = 0.8 \text{ (between 0.7 and 0.9)}$$

$$C_S = 0.74$$

$$S_n = (55)(1)(0.8)(0.74) = 32.6 ksi$$

0.75$S_u = \left(0.75(110) = 82.5\right) ksi$

For torsion,

$$S_n' = 55 ksi$$

$$C_L = 0.58$$

$$C_G = 0.9$$

$$C_S = 0.74$$

$$S_n = (55)(0.58)(0.9)(0.74) = 21.2 ksi$$

0.9$S_{ns} = \left(0.9(0.8)(110) = 79.2\right) ksi$
Homework

Known: \( D=\text{in}, \ S_u = 110\text{ksi}, \ S_y = 77\text{ksi}, \) reversed bending, axial, torsional loading, steel, machined surface

Find: \( S_n(6 \times 10^4 \text{ life cycles}) \)
Homework

Known: \( D=\text{in}, \ S_u = 110\text{ksi}, \ S_y = 77\text{ksi}, \) reversed bending, axial, torsional loading, steel, machined surface

Find: \( S_n(6 \times 10^4 \text{ life cycles}) \)

\[
\begin{align*}
\text{Stress, ksi (log)} &: 99.0 \quad 82.5 \\
\text{Cycles (log)} &: 10^3 \quad 10^4 \quad 10^5 \quad 10^6 \quad 10^7 \\
\end{align*}
\]

- Machined surface
- Bending
- Axial
- Torsion

\[
\begin{align*}
\sigma_a (\text{ksi}) &: 48 \quad 36 \quad 32.6 \\
\sigma_m (\text{ksi}) &: 0 \quad 20 \quad 40 \quad 60 \quad 80 \quad 100 \quad 120 \\
S_u & = 110 \text{ ksi} \\
S_y & = 77 \text{ ksi} \\
\end{align*}
\]

Axial 

6 \times 10^4 \text{ cycle life}

(33, 33) 

\( \sigma_a = \sigma_m \)
Homework

Known: $D = \text{in}, S_u = 110\,\text{ksi}, S_y = 77\,\text{ksi}$, reversed bending, axial, torsional loading, steel, machined surface

Find: $S_n(6 \times 10^4 \text{ life cycles})$

![Graph showing stress cycles life](image)

Can't go here due to surface yielding.

$6 \times 10^4 \text{ cycle life}$

$S_{us} = 0.8 \, S_u = 88$

$S_{ys} = 0.58 \, S_y = 45$