1. (8 points) TRUE or FALSE: An A992 (F_y=50 ksi) W12x87 shape is non-compact for bending.

   **TABLE 1-1: W12x87 NOT NOTED AS NON-COMPACT FOR BENDING.**

2. (25 points). Using ASD, what is the maximum bending moment that the center-point-loaded A992 W8x58 beam is safely allowed to carry?
   Given: Braced at the end-points, only.

   \[ C_b = 1.32 \]

   \[ L_b = 16' \]

   \( \frac{M_n}{\sigma} \) \text{ chart} = 135'k \text{ per TABLE 3-10 (L_b=16')} \]

   \[ M_n = 1.32(135) \leq \left[ \frac{M_p}{\sigma} = 149.5'k \right] \]

   \( \downarrow \)

   \[ 178.2 \leq 149.5 \]

   \[ \therefore \frac{M_n}{\sigma} = 149.5'k' \]
3. (8 points) TRUE or FALSE? An A992 (Fy=50 ksi) W18x76 shape that has its compression flange laterally braced every 12 feet will reach the fully plastic moment, if loaded to failure with constant moment.

**TABLE 3-2:** \( L_P = 9.22' \) **FALSE**

4. (25 points) Using ASD, determine the maximum uniformly-distributed-load \( w \) that the A992 W8x58 beam may safely carry, considering the allowable bending moment. Report your answer in units of lbs/ft.

Given: Span is 25-feet, simply-supported. The beam supports a concrete slab, cast on metal decking, welded to the top flange of the beam.

**Max Safe Uniform Load \( w = ? \)**

- **Span = 25 feet**
- **Concrete Slab**
- **No LTB - Continuous Lateral Bracing**

**TABLE 3-6:** \( L = 25' \) - Not in Table

**TABLE 3-2:** \( \frac{M_o}{A} = 149 k' \)

**SET** \( 149 = \frac{WL^2}{8} \) \( \Rightarrow W = 1.907 k/ft \)
5. (9 points) What is the ASD allowable bending moment for an A992 (F_y=50 ksi) W24x$8$ shape that has its compression flange continuously braced against lateral movement?

\[ \frac{M_n}{M_p} = \frac{559}{5} = 11.18 \]

**TABLE 3-2**:

\[ \frac{M_n}{M_p} = \frac{559}{5} \]

6. (25 points) Using ASD, determine the maximum allowable strong-axis bending moment for a W21x44 beam that has been made out of a new high-strength steel with F_y=75ksi and F_u=100ksi, for the uniformly-loaded situation shown below.

**Given:** Span is 25 feet, simply-supported. The beam supports a concrete slab, cast on metal decking, welded to the top flange of the beam.

**Compact for Flange:**

\[ \lambda = 7.22 \quad \text{(TABLE 1-1)} \]
\[ \lambda_p = 0.38 \sqrt{\frac{29000}{75}} = 7.47 \quad \Rightarrow \text{Compact Flange} \]

**Web:**

\[ \lambda = 53.6 \]
\[ \lambda_p = 3.76 \sqrt{\frac{29000}{75}} = 73.9 \quad \Rightarrow \text{Web is Compact} \]

:. W/ L:b=0

\[ \frac{M_n}{M_p} = \frac{F_y Z}{L} = \frac{75(95.4)}{8/3} = 4293 \] k"f

\[ \frac{M_n}{M_p} = 4293 \text{ k"f} = 358 \text{ k"f} \]