You are allowed to have the AISC manual, drawing equipment, and a calculator, only.

**Given (For Problem 1): Available Materials**

<table>
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<tr>
<th>$d$</th>
<th>Wall thick</th>
<th>Area ($\text{in}^2$)</th>
<th>$I_x$</th>
<th>$I_y$</th>
<th>$r_x$</th>
<th>$r_y$</th>
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<tbody>
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</table>

**Bonus Questions**

1. (0.1 points) According to the 2015 National Students Steel Bridge Competition Rules, what is minimum distance that the bridge must span?

2. (0.1 points) According to the 2015 National Students Steel Bridge Competition Rules, what is minimum width of the vehicle passageway?

3. (0.1 points) According to the 2015 National Students Steel Bridge Competition Rules, what is minimum clearance that the bridge must provide, over the river?

4. (0.1 points) According to the 2015 National Students Steel Bridge Competition Rules, what is the size of the member box, into which a legal member must fit?

5. (0.1 points) How many gallons of beer are contained in a standard US beer barrel?

6. (2 points) What is the ASD $r_a/\Omega$ for a ¾” A325-N bolt in single shear?
1. (40 points). Your steel bridge team needs you to select the lightest (smallest area, $A$) SQUARE TUBE for the top chord of its truss, selecting from among the materials list, on page 1 ($F_y=50$ksi). In the truss plane, $KL_{short}=4\text{ft}=48"$. For out-of-plane buckling, $KL_{long}=8'=96"$. The applied top chord force is 2.00 kips, in compression. HINT: As you guess, you should anticipate that the slenderness will be somewhat high.

**Out-of-Plane Buckling**

$KL_{long} = 8\text{ft} = 96"$

**In-Plane Buckling**

$KL_{short} = 4\text{ft} = 48"$

Write Final Answers Here:

- Tube Size: __________________
- $P_n/\Omega = __________________$ kips
2. (30 points) A funicular arch is constructed over an 18’ gap, supporting a uniform load \( w = 1 \text{ kip/ft} \) over the middle 6’. If the maximum arch height will be 5 feet, determine the height \( Y \) and the compressive stress in the arch, at the support, if the cross-section of the arch is 10” x 10”.

Write Final Answers Here:

\[ Y = \text{feet} \]

Stress at Support: \( \text{ksi} \)
3. (30 points). Select the lightest A992 W14 column that is adequate per ASD if it is subjected to an ASD applied load \( P = 850 \text{kips} \) (consisting of \( P_D = 450 \text{kips} \) and \( P_L = 400 \text{kips} \)) and it is braced, as shown:

Write Final Answers Here:

Lightest W14 that is adequate is:

________________________