ARCH 631. Assignment #1

Date: 9/1/15, due 9/10/15

Worth 20 pts.

Problems:

1. A 24-foot-long steel beam is installed when the temperature is 45°F. How much will it expand if the temperature rises to 75°F? The coefficient of expansion of steel is 0.0000065.
   Answer: 0.056 in

2. What is the horizontal thrust at each end of the three-hinged arch shown below?

   Answer: 249.7 k

3. What is the moment about point O of the three forces shown above?
   Answer: 10,755 lb-ft

4. Complete text problem 2.4 on page 85.

   The following three forces act through a point: \( P \) at \( \theta_x = 45^\circ \), \( 2P \) at \( \theta_x = 180^\circ \), and \( P \) at \( \theta_x = 270^\circ \). Find the equivalent resultant force. [See Figure 2.59(Q4).]
   Answer: \( 1.33P \) at 192.8°.

5. Complete text problem 2.7 on page 85.

   Determine the reactions for the structure shown in Figure 2.59(Q7).
   Answer: \( R_A = 2667 \) lb ↑ and \( R_B = 667 \) lb ↓.

6. Complete text problem 2.13 on page 85 for figure Q13c.

   Determine the reactions for the beams shown in Figure 2.59(Q13).
   Answer: \( R_{Ax} = P/2 \rightarrow, R_{Bx} = P/2 \leftarrow, R_{By} = P \uparrow \).
7. Complete text problem 2.24 on page 86.
   2.24 What is the unit strain present in an aluminum specimen loaded to 10,000 lb/in.²? Assume that 
   \( E_a = 11.3 \times 10^6 \text{ lb/in.}^2 \)
   Answer: 0.000885 in./in.

8. Complete text problem 2.27 on page 86.
   2.27 A steel bar that is 20 mm in diameter is 5 m long and carries a tension force of 20 kN. How much 
   does the bar elongate? Assume that \( E_s = 0.204 \times 10^6 \text{ N/mm}^2 \).
   Answer: 1.56 mm.