ARCH 631. Assignment #1

Date: 8/28/12, due 9/8/12

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 100.
   2.4 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 100.
   2.7 Determine the reactions for the structure shown in Figure 2.59(Q7).
   Answer: \( R_A = 2667 \) lb ↑ and \( R_B = 667 \) lb ↓.

   2.13 Determine the reactions for the beams shown in Figure 2.59(Q13).
   Answer: \( R_{L/2} = P/2 \rightarrow, R_{R/2} = P/2 \leftarrow, R_{B} = P \uparrow.\)

2.24 What is the unit strain present in an aluminum specimen loaded to 10,000 lb/in.²? Assume that $E_a = 11.3 \times 10^6$ lb/in.²
Answer: 0.000885 in./in.

8. Complete text problem 2.27 on page 102.

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 $E_s = 0.204 \times 10^6$ N/mm².
Answer: 1.56 mm.