ARCH 614. Assignment #3

Date: 2/2/16, due 2/9/16

Problems: all but 3A & 3B from Ambrose & Tripeny, Chapter 2 & 1, pgs 59, 65, 32, and 36.

Note: Problems marked with a * have been altered with respect to the problem stated in the text.

(4%) Problem 2.1.A. What axial compression load may be placed on a short timber post whose cross-sectional dimensions are 9.5 x 9.5 in. if the allowable unit-compressive stress is 1100 psi? (normal stress)

Partial answers to check with: P = 99.3 kips

(6%) 3A) What should be the diameter of the bolt shown in Figure 2.1d if the shearing force is 9000 lb and the allowable unit shearing stress is 15 ksi? (shear stress)

Partial answers to check with: d = 0.874 in.

(4%) Problem 2.1.C. Determine the minimum cross-sectional area of a steel bar required to support a tensile force of 50 kips if the allowable unit tensile stress is 20 ksi. (normal stress)

(6%) Problem 2.2.D. * USE METRIC UNITS. A 12.7 mm diameter round steel rod 12.19 m long supports a load of 17.79 kN. How much will it elongate? (kN/mm² = 10⁶ kPa )

Partial answers to check with: δ = 8.56 mm

(20%) 3B) Use US customary units. E_aluminum = 10,000 ksi

An aluminum curtain wall panel 12’ (3.66 m) high is attached to large concrete columns (top and bottom) when the temperature is 65°F (18.3°C). No provision is made for differential thermal movement vertically. Because of insulation between them, the sun heats up the wall panel to 120°F (48.9°C) but the column only to 80°F (26.7°C). Determine the consequent compressive stress in the curtain wall. (thermal stresses)

Partial answers to check with:

\[ \delta_{restrained} = 0.0895 \text{ in, } f = 6,220 \text{ psi} \]

(20%) Problem 1.6.A. * USE METRIC UNITS. Figure 1.18 represents a beam in equilibrium with three loads and two reactions. Select five different Using the centers of moments at each load (not the end reactions), and write the equation of moments for each, showing that the sum of the clockwise moments equals the sum of the counterclockwise moments. (moment of a force)
(20%) **Problem 1.7.B.** * USE US UNITS. Find the reactions for the beam shown in Figure 1.22b. (equilibrium of rigid bodies) Partial answers to check with: $R_1 = 8,375 \text{ lbs}$, $R_2 = 10,625 \text{ lbs}$.

(20%) **Problem 1.7.E.** * USE METRIC UNITS. Find the reactions for the beam shown in Figure 1.22e. (equilibrium of rigid bodies)