ARCH 631. Assignment #5

Date: 9/19/13, *due 10/10/13* *Worth 25 pts.*

Problems:

1. Complete text problem 8.3 on page 321.

8.3 Using the expressions suggested in Section 8.4.2, determine the design moments for a three-span beam that is continuous over four supports. (The ends are integral with the column supports.) Determine the critical design positive and negative moments for each span. Assume that the structure carries a uniformly distributed load of 300 lb/ft and that each span is 30 ft.

***Partial** Answer:* $M+_{at\ interior}$= 16,875 lb-ft, $M-_{at\ other\ supports}$= 24,545 lb-ft

{+ends, -exterior face of first interior support, -interior faces of exterior supports integral with column}

2. For the three span beam of Problem 1 determine the critical design shear force.

Answer: $V_{max\ at\ interior}$= 5,175 lb

3. Complete text problem 10.3 on page 382.

10.3 What are the maximum positive moments present in a square plate that is simply supported at its corners by four columns and that carries a uniformly distributed load of 80 lb/ft^2? Assume that the plate is 6 in. thick and measures 15 ft by 15 ft. Assume also that the unit weight of reinforced concrete is 150 lb/ft^3. (See Figure 10.9)

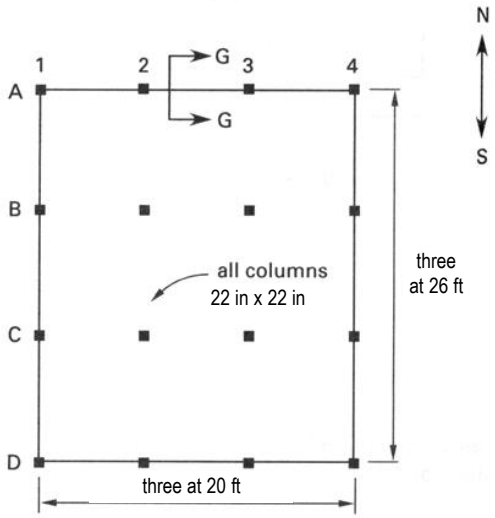
Answer: 5231 ft-lb/ft.

4. Complete text problem 10.4 on page 382.

10.5 A 60 × 60-ft homogeneous plate carries a live-plus-dead load of 100 lb/ft^2. Consequently, the plate has a bending moment of $m = 0.11wa^2 = 0.11(100)(60 \times 60) = 40{,}000$ ft-lb/ft at midspan. A bar system with a depth of 3 ft has members spaced 4.0 ft on center, has a similar self-weight, and carries the same uniformly distributed loading. What is the *approximate* force present in a typical upper or lower chord bar member at midspan?

Answer: $T = C = 53{,}333$ lb.

5. A 20 x 26-ft two way interior bay flat plate supports a live loading of 40 lb/ft^2 and has a dead load of 120 lb/ft^2. All columns are 22 in. square (*reducing the longer side clear span, but not the strip widths).* Determine **all** the design moments for the N-S direction. Use an ultimate strength design approach (combined loads) *<u>based on ASCE-7</u> (Note Set 3.2).*



***Partial** Answer:* w= 208 lb/ft^2, (there are two similar methods) M_{U_T} (M_o) = 303,694 lb-ft, column strip $m-$ = 14,881 $^{lb\text{-}ft/ft}$ middle strip $m+$ = 4,252 $^{lb\text{-}ft/ft}$ *{in addition to +column m+, middle strip m-}*

6. For the two-way system of Problem 5, estimate the plate thickness based on the longest clear span.
Answer: $t > 9$ in.

7. Complete text problem 10.6 on page 382.

10.6 What is the maximum negative bending moment developed in a 50 × 50-ft fully fixed plate that carries a load of 100 lb/ft^2? (See figure 10.12.)
Answer: $m = -12{,}825$ ft-lb/ft.