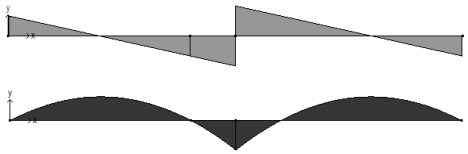
ARCH 331. Assignment #5

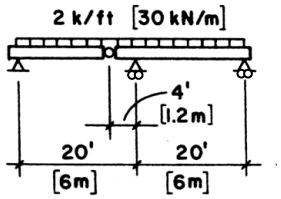
Date: 6/13/14, *due 6/17/14* *Pass-fail work*

Problems: supplemental problems (5A, etc.) **and** from Onouye, Chapters 4 & 10
*Notes: Problems marked with a * have been altered with respect to the problem stated in the text.*
Selected problems not required to be worked will be announced in class.

(25%) 5A) Using **metric units** investigate the beam shown in Figure 3.48*c*. Find the reactions and draw the shear and moment diagrams, indicating all critical values. *(compound beams)*

Partial answers to check with:
V_{max} = *108 kN,*
M_{max} = *-108 kN-m.*



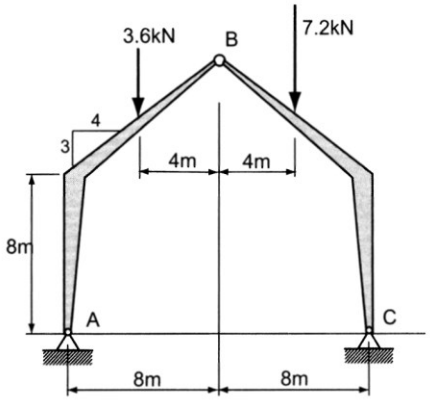


(*c*)

Figure 3.4.8 (c)
Reference for Problem 6A)

(25%) **4.2.7** A three-hinged gabled frame supports two unequal roof loads as shown. Determine the support reactions and the internal pin forces at *B*. *(pinned frames)*

Partial answers to check with: A_x = *+1.54 kN,*
A_y = *+4.5 kN,* C_x = *-1.54 kN,*
C_y = *+6.3 kN,* B_x = *-1.54 kN (wrt AB),*
B_y = *-0.9 kN (wrt AB).*



Problem 4.2.7

(6%) 5B) A 22-ft span beam is fixed at both ends and carries a single concentrated load of 16 kips at midspan (no image). Find the reactions and construct the complete shear and moment diagrams *using beam diagram formulas.*

Partial answers to check with: V_{max} = *8 kips,* M_{max} = *44 k-ft*

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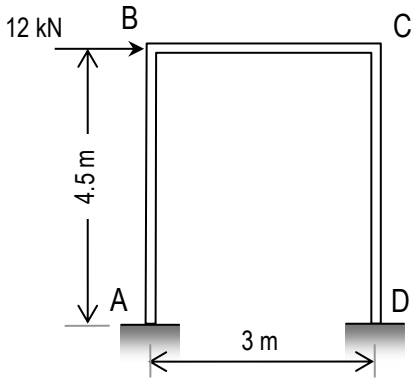
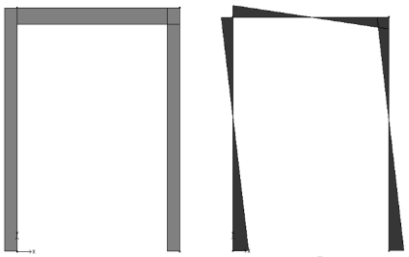
(22%) 5C) For the rigid frame shown, the reactions *using an approximate analysis method* at A are: A_x = -6.0 kN, A_y = -8.10 kN, M_A = 14.85 kN·m, and at D are: D_x = -6.0 kN, D_y = 8.10 kN, M_D = 14.85 kN·m. Plot the shear and bending moment diagrams and identify V_{max} and M_{max}. Also sketch the deflected shape. (*equilibrium & semigraphical method)*



Partial answers to check with:

M_{BA}= *12.15* $^{kN\text{-}m}$, M_{CB}= *-12.15* $^{kN\text{-}m}$,
V_{max} = *8.10 kN,* M_{max} = *-14.85* $^{kN\text{-}m}$

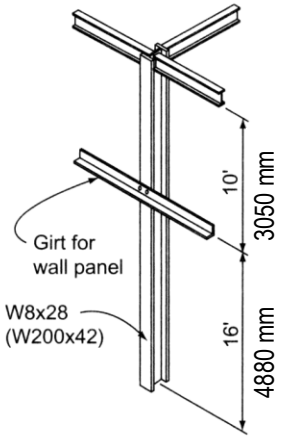


(8%) 5D) For the frame of problem 5C, use Multiframe software to find the shear and bending moment values to verify your work from the semigraphical method. Use the standard steel section you have been assigned which is posted in My Grades on eCampus. Submit the data file (.mdf) on eCampus (under Assignments: Assignment 5) and provide a print of the shear diagram (V), bending moment diagram (M), and deflected shape (δ). ***Note: The values from Multiframe will not be identical to the approximate analysis values, but will be close.***

Note: The "Find, Given, Solution" format is not required.

***Use metric units. (The SI values have been corrected.)**

(14%) **10.2.6** Determine the critical buckling load and stress for the W8×28 (*W200x42*) column shown. $E = 29 \times 10^3$ ksi ($E = 200 \times 10^3$ *MPa*). **(*1 MPa = N/mm^2)**
(*Euler buckling formula)*



Problem 10.2.6

Partial answers to check with:

L_e/r_x = *90.5 and* L_e/r_y = *118.7,*
$P_{cr\text{-}x}$ = *1281 kN (or 182 kN),*
$P_{cr\text{-}y}$ = *748 kN (or 745 kN),* $\therefore f_{cr}$ = *141 MPa*

Note: there is only ONE critical buckling load