University of California, Berkeley
Department of Civil and Environmental Engineering
CE120 / Instructor: Marios Panagiotou / Spring 2009

04/22/09

Mid-term Exam 2

Duration (2 hours and 15 minutes)

Name: _____

	Maximum Points	Score
Problem 1	30	_____
Problem 2	30	_____
Problem 3	30	_____
Problem 4	20	_____
		_____
Total	110	_____

Problem 1 (30 points)

For the beam structure shown below:

i) Compute the reactions and draw the bending moment and shear force diagrams.

ii) Draw qualitatively the deflected shape.

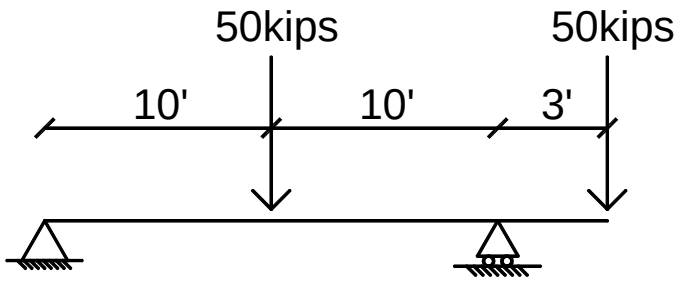
iii) Check if the beam has adequate longitudinal reinforcing steel on top.

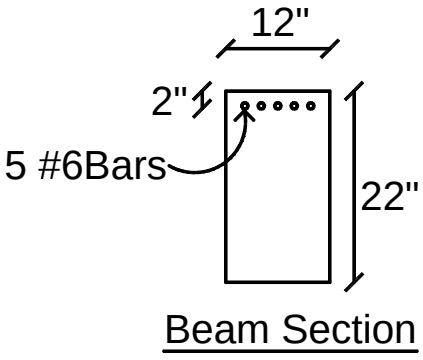
iv) Design the bottom longitudinal reinforcing steel as well as the reinforcing steel for shear. Show clear sketches of the side view and section view of your design.

Notes:

1) For the design part you have to use the **LRFD** method. **Do not** consider any load factors.

2) For concrete it is given $f_c^{'}$=4 ksi and for steel f_y=60 ksi.





Problem 2 (30 points)

For the frame structure shown below:

i) Compute the reactions and draw the bending moment, shear force and axial force diagrams.

ii) Find the dimension b_f of the I-section in order members BC and CD to have adequate flexural and shear strength.

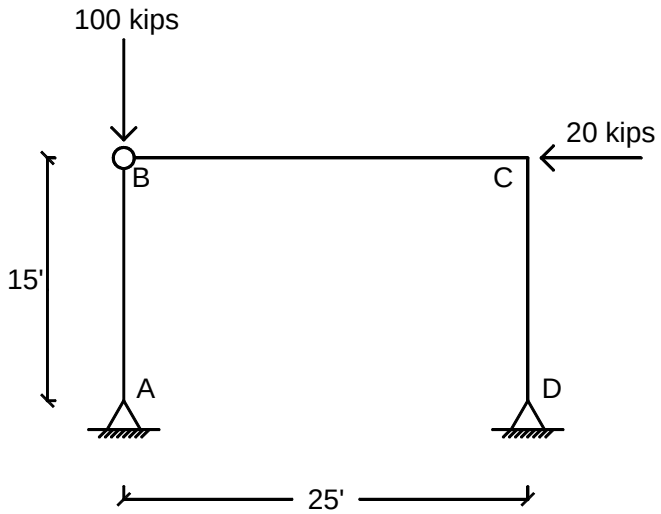
iii) Find the minimum section moment of inertia I_{AB} in order member AB to have adequate strength against buckling. The critical buckling load is $P_{cr} = \pi^2 EI / (\kappa L)^2$, κ=1.

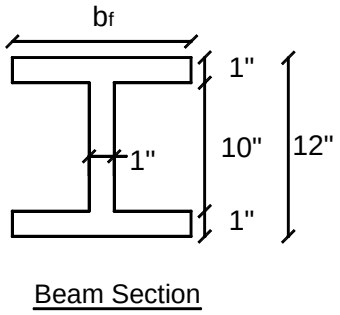
Notes:

1) For the design part you have to use the **LRFD** method. **Do not** consider any load factors.

2) Find only one b_f which is adequate for bending and shear for both members BC and CD.

3) Consider A36 steel, E=29000 ksi.

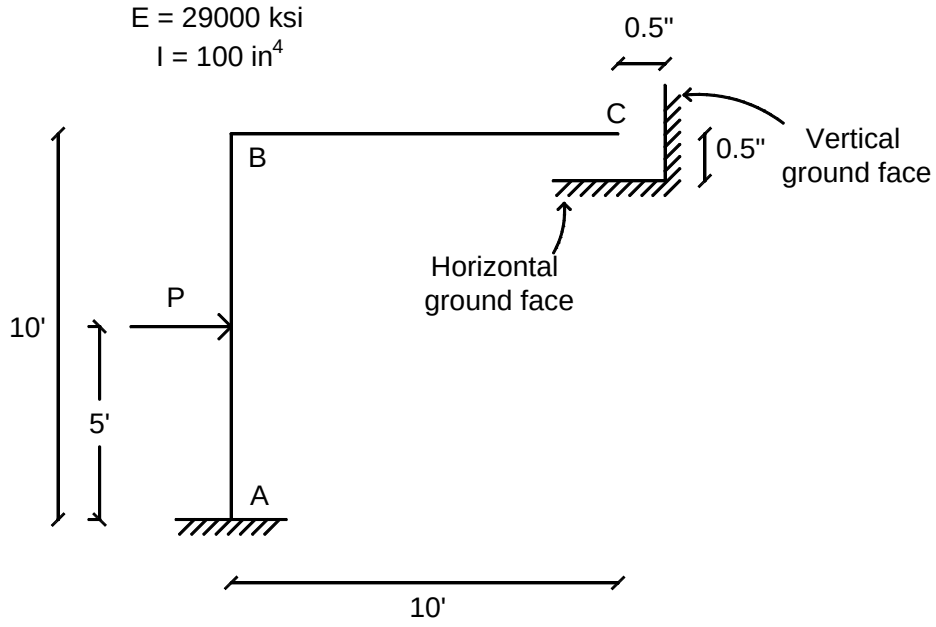




Beam Section

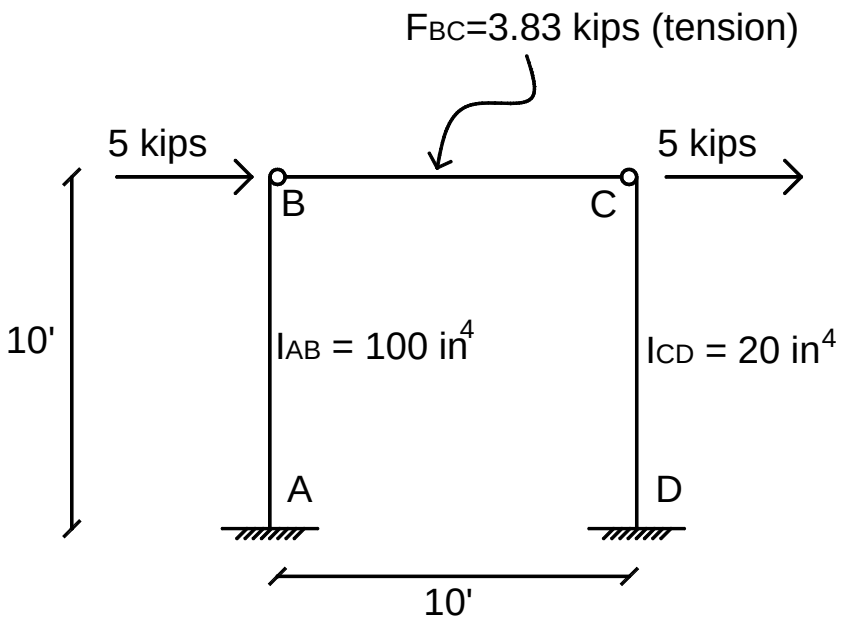
Problem 3 (30 points)

For the structure shown below find the value of force P for which point C will touch the ground. Which face (vertical or horizontal) of the ground point C will touch? Members AB, BC have the same EI shown below.



Problem 4 (20 points)

The structure shown below is indeterminate to the first degree. It is given that the developed force in member BC is F_{BC} = 3.83 kips and is ***tension***. What is the section area A_{BC} of member BC? For all members E=29000 ksi.



E=29000 ksi
(all the members)