Department of Civil and Environmental Engineering,   Fall Semester, 2014

ENCE 353 Midterm 1, Open Notes and Open Book

Name : _____

Exam Format and Grading. This exam has four questions. Answer question 1. Then answer **two of the three** remaining questions. Cross out the question you do not want graded in the table below.

Partial credit will be given for partially correct answers, so please show all your working.

Question	Points	Score
1	20	
2	10	
3	10	
4	10	
Total	40	

Question 1: 20 points

COMPULSORY: Shear Forces and Bending Moments in a Beam Structure. Consider the three-span beam structure shown in Figure 1.
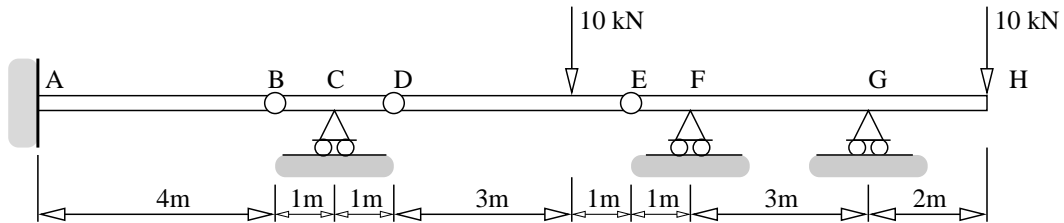

Figure 1: Three-span beam structure.

The cantilever is fully-fixed to the wall at Point A. Points B, D and E are hinges.

[1a] (5 pts). Compute the degree of indeterminacy for the three-span beam.

[1b] (5 pts). Compute the reactions at points A, C, F and G.

[1c] (10 pts). Compute and draw the shear force and bending moment diagram along the beam.

Question 2: 10 points

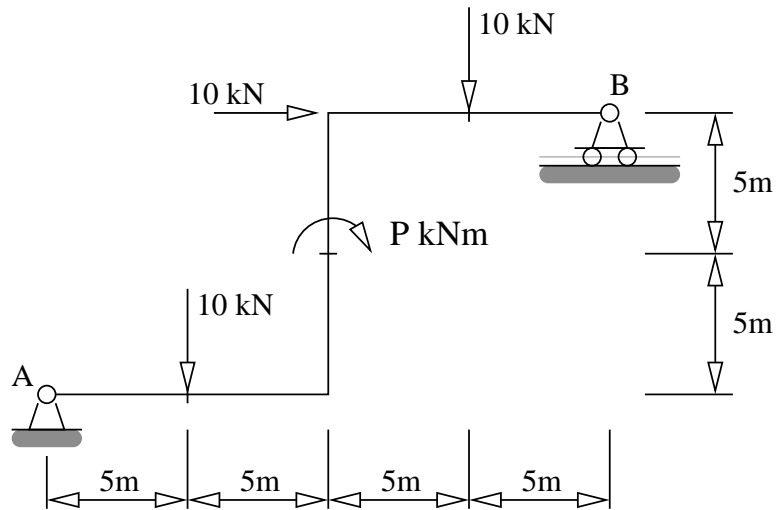**OPTIONAL: Support Reactions in a S-Shaped Beam.** Consider the S-shaped beam structure shown in Figure 1.

Figure 2: S-shaped beam structure.

[2a] (5 pts). What is the magnitude of the applied momoment P kN.m that will result in **equal values** of **vertical reaction** at supports A and B.

[2b] (5 pts). If P = 10 kN.m, what is **total reaction force** at support A?

Question 3: 10 points

OPTIONAL: Zero Force Members in a Truss. Identify all of the zero force elements in Figure 3.
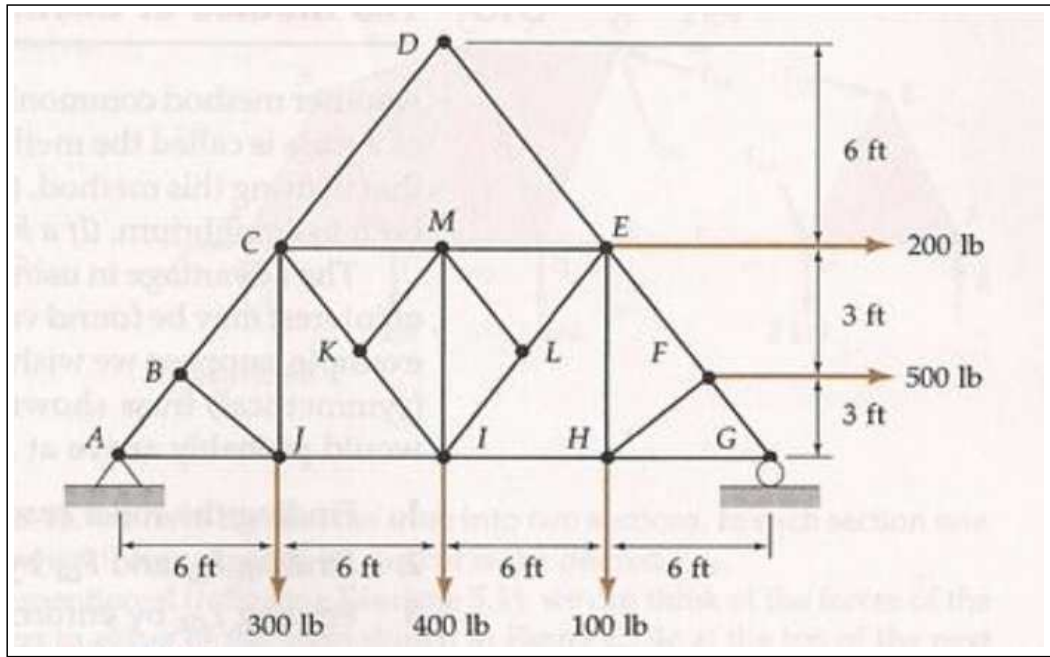

Figure 3: Twenty one element truss structure.

Question 4: 10 points

OPTIONAL: Degree's of Indeterminacy. Compute the degree of indeterminacy for the structures shown in Figures 4 and 5.
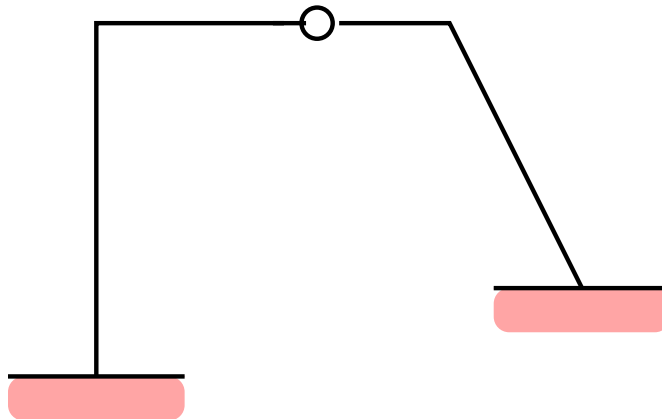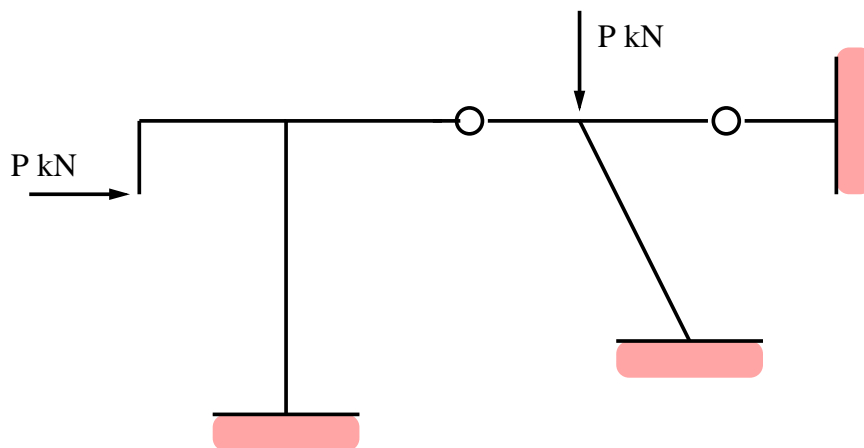
[4a] (5 pts).

Figure 4: Simple portal frame.

[4b] (5 pts).

Figure 5: A more complicated frame structure.