Practice Problems for the Final Exam. Not tuned for time. Solutions will NOT be posted.

1. A radio tower is shown below. The tower is pinned to the ground at point O. The tower height is h, effective properties EI. The tower is supported by three guy wires, as shown, and the guy wires have properties EA. In what follows, neglect axial deflection in the tower, but include the elongation of the cables.
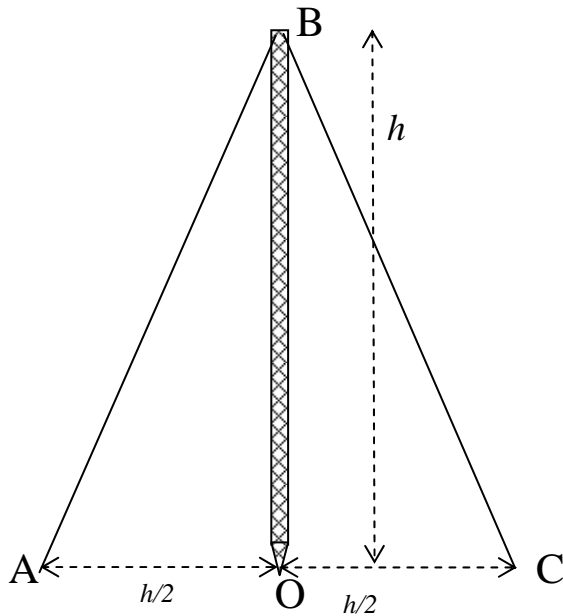

The tower is subjected to a wind load from right to left, which may be considered to be evenly distributed with magnitude w (force/unit length). Cable BC goes slack during this load, so the situation is represented below.
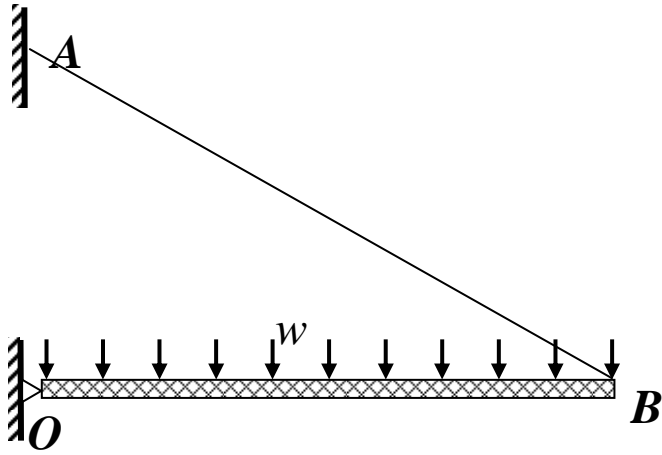
1. Find the reactions at O and the tension in the cable AB.
2. Determine the deflection of the tower as a function of x/L.

2. See the two story building with uniformly distributed loads shown below. For an approximate analysis, assume there are hinges as shown. Based on these assumptions, Find the base reactions and plot the moment diagrams in members AB, BC, BE, and CD. W
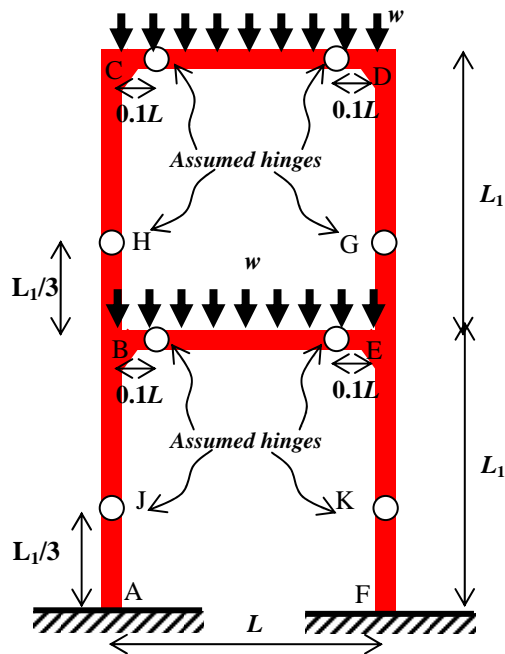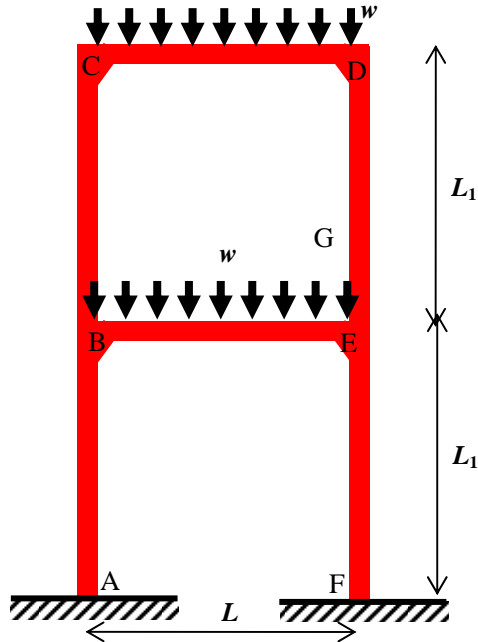
3. For the frame shown, determine the reactions at points A and C, as well as the forces and moments transmitted through the joint B. Assume a full moment connection at B.
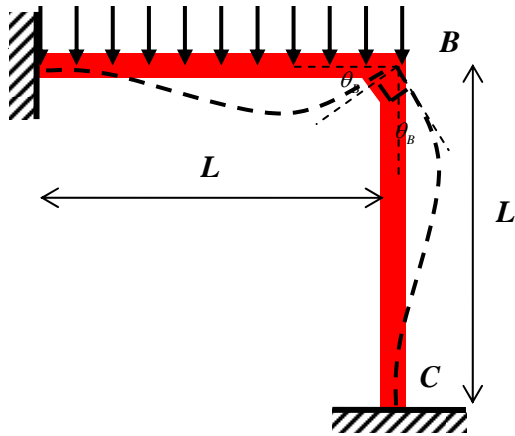
4. The Hanshin Expressway in Kobe Japan is shown below.

Assume a section of the bridge can be idealized as a rigid deck connected to three columns as shown below. The columns are circular with properties *EI*. The deck has a total mass of *m*. Neglect the masses of the cars and the rotational inertia of the deck.

Determine the natural frequencies of longitudinal and lateral vibrations in terms of the parameters of the problem.

$x(t)$

Side View

$y(t)$
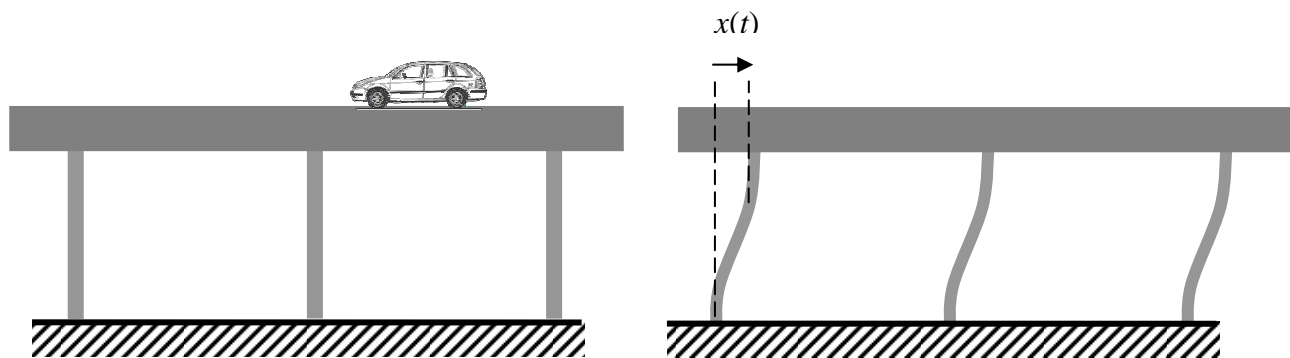
Front View

5. The two story building has mechanical equipment on its roof, which effectively doubles the mass of the top floor. Find the natural frequencies of vibration of the structure and the associated mode shapes.