

Problem Set 5

Problem 5.1

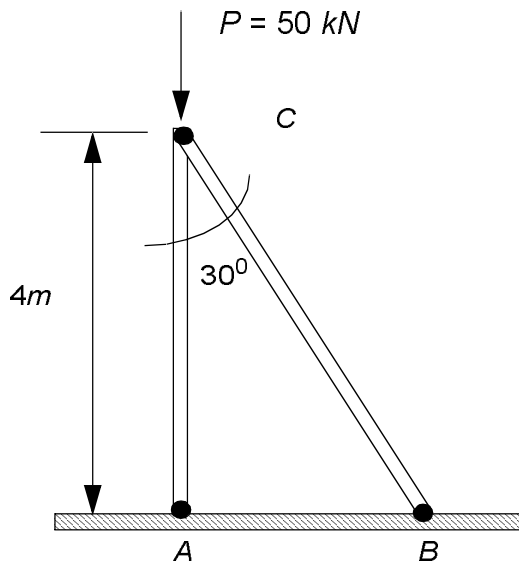
In Problem 4.1 assume $P = 20$ kN.
Find and estimate of the lateral displacement.

Problem 5.2

Determine the displacement C experiences. Use a non-linear approach and stop when $\Delta P \leq 0.05P$

Compare the results obtained with a linear approach.

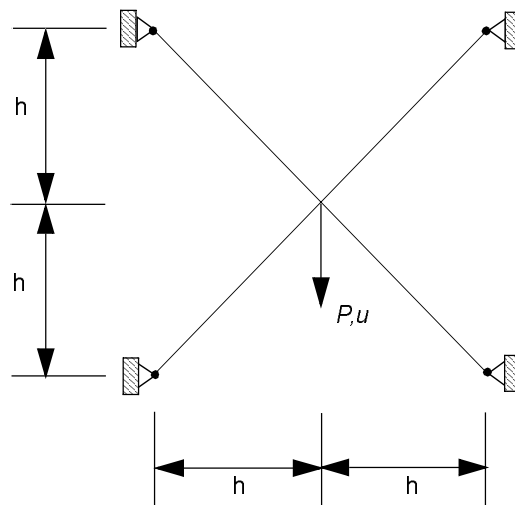
Area = 40 cm^2
 $E_s = 200,000 \text{ MPa}$



Problem 5.3

Assuming that all members are initially stressed with a tensile force, T_0 , and their stiffness factors ($\frac{AE}{L}$) are equal to k^* .

Establish the relation between P and u .



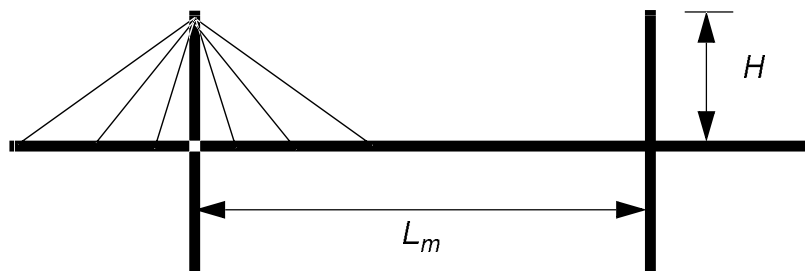
Problem 5.4

Consider a 3 span symmetric cable stayed system with a fan arrangement of cables.

a) Estimate the distribution of the required cable areas in the main span corresponding to the following conditions:

- Tower Height, $H = 0.2 L_m$
- Main Span, $L_m = 600m$
- Segment size, $\Delta L = 15m$
- Allowable stress in cable is $640 MPa$
- Modulus of cable is $190,000 MPa$
- Applied Loading is a uniform load of $100 kN/m$
- Maximum displacement is $L_m/400$

b) Describe the effect that the lateral movement of the tower has on the required cable area.

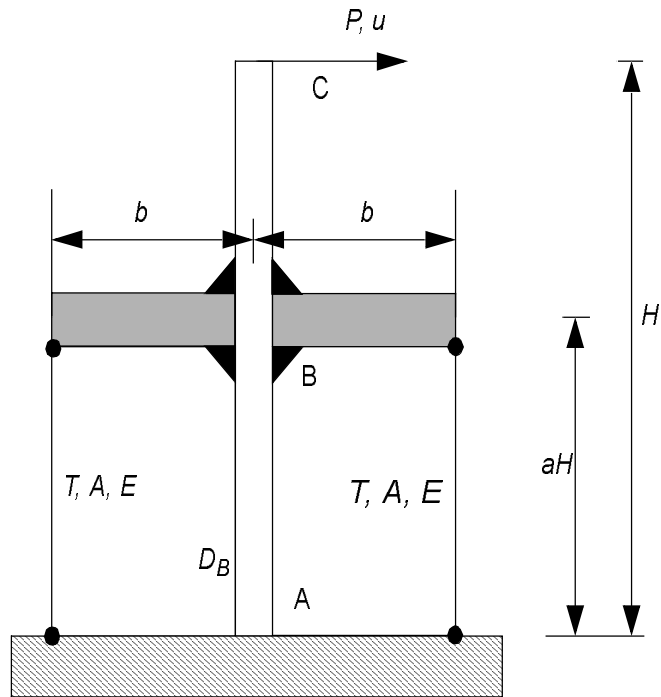


Problem 5.5**Part A:**

Assume the outriggers are infinitely stiff, the beam bending rigidity is constant, and the cables are initially tensioned to a level of T_0 .

Suppose a lateral load is applied at point C. Determine an expression for u in terms of the structural parameters.

Discuss how would you establish an approximate value for T_0 .

**Part B:**

Describe how would you extend the analysis procedure to deal with the case of 2 outriggers shown.

