Problem 4.1

The cantilever has a redundant support at a distance “a” from the root. What can you say about the shear force and bending moment diagram?

Problem 4.2 (3.21 text)

Find an expression for the internal moment and force acting at $x$, some arbitrary distance from the root of the cantilever beam. Neglect the weight of the beam.

What if you now include the weight of the beam, say $w_0$ per unit length; how do these expressions change?

What criteria would you use in order to safely neglect the weight of the beam?

Problem 4.3 (3.18 text)

A beam, carrying a uniformly distributed load, is suspended by cables from the end of a crane (crane not shown). The cables are attached to the beam at a distance $a$ from the center line as shown. Given that $a = (3/4)S$ and $L = (3/2)S$

i) Determine the tension in the cable $AB$. Express in non-dimensional form, i.e., with respect to $w_0 S$.

ii) Determine the tension in the cables of length $L$.

iii) Sketch the beam’s shear force and bending moment diagram. Again, non-dimensionalize. What is the magnitude of the maximum bending moment and where does it occur?

iv) Where should the cables be attached - ($a/S = ?$) - to minimize the magnitude of the maximum bending moment? What is this minimum value?

v) If $a/S$ is chosen to minimize the magnitude of the maximum bending moment, what then is the tension in the cables of length $L$? Compare with your answer to (ii).

Due Friday, 4 October