University of Massachusetts, Amherst
CEE/MIE 630: Advanced Solid Mechanics

HW 11: Exam practice
(a) Use Eq. 13.1 and see example 13.1 for derivation of wide beam equation.

\[ \frac{d^4w}{dx^4} = \frac{P}{D} \]

This is exactly analogous to the standard beam equation

\[ \frac{d^4v}{dx^4} = \frac{q}{EI} \]

with \( D = \frac{Eh^3}{12(1-\nu^2)} \)

Replacing \( EI \).

Therefore, we can simply take the solution for a fixed - fixed beam and sub. \( D \) for \( EI \)

for the beam

\[ \frac{w}{L} = \frac{1}{24EI} \left( -x + \frac{x^3}{3} + \frac{x^5}{5} \right) \]

\[ V(x) = \frac{W}{2EI} \left( x^2 - x \right) \]

in the plate

\[ W(y) = \frac{P}{24EI} y (b - y)^2 \]

(b) If \( \nu = 0.3 \), the max disp of the plate is

\[ A_{max, p} = p \frac{b}{4} \frac{1}{4} \frac{1/2(1-\nu^2)}{24EI} \frac{L^3}{h^3} \]

in the beam

\[ A_{max} = U \frac{b^3}{4} \frac{1}{4} \frac{1/2}{24EI} \frac{b}{h^3} \]

Note: \( I = \frac{h^3}{12} \)

\[ \Delta_{max} \text{ plate} = 0.91 \Delta_{max, p} \text{ beam} \]