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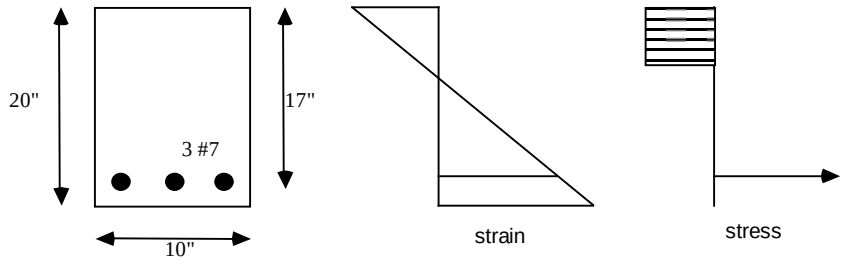
Moment

Question No. 1

Determine the ultimate moment capacity of the section shown in the figure below. f'_c=3,000 psi and f_y=50,000 psi.



Question No. 2

Repeat question no. 1 for f_y=40,000 psi, 60,000 psi and f_y=80,000 psi. Plot the ultimate moment capacity as a function of the strength of the steel.

Question No. 3

What is the strain of the steel and the strain on the top of the beam in the section shown in problem no. 1, for the 3 grades of steel? Assume that the corresponding ultimate moment is applied in every case.

Question No. 4

Determine the required area of steel so the cross-section shown in Fig. 1, if the factored bending moment is 1,000 kips-in. Use materials: f'_c=3,000 psi and f_y=40,000 psi. What bars should be used?

Question No. 7

a. Determine the required axial force, applied by a cable at the centroid of the cross-section, in order to eliminate the tensile stresses in the simply supported concrete beam shown in the figure below. Determine the stresses in the elastic range using the expression: $f_b = \frac{Mc}{I}$

b. What is the elongation of the cable, if it has been sized to a maximum stress of 70,000 psi ? (E_{steel} = 30,000,000 psi)

c. Determine the required axial force, applied by a cable located 4" below the centroid of the cross-section, in order to eliminate the tensile stresses in the simply supported concrete beam shown in the figure below.

d. What would be the "ideal" location of the cable along the length of the beam? Show schematically (no calculations required), and assume that the location of the cable in the cross-section can change along the beam.