CIVL 4135
HOMEWORK SET 5A

I. Calculate the moment when the tension crack has progressed

(1) 3.0 inches *answer:* ? in-kips

(2) 3.5 inches *answer:* ? in-kips

(3) 5.0 inches *answer:* 318 in-kips

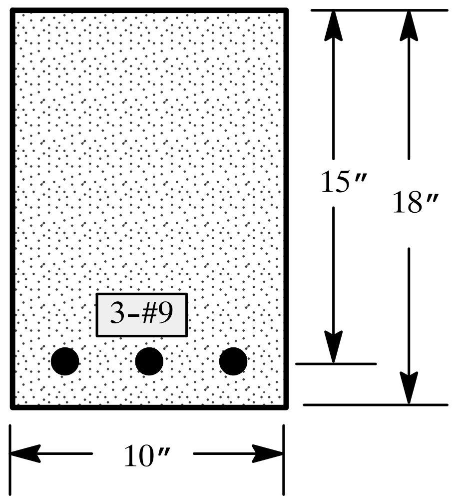
(4) 6.0 inches *answer:* ____________

from the bottom of the cross-section shown below.

f'_c = 4 ksi

f_y = 60 ksi

f_r = 530 psi



II. Calculate the moment when the reinforcement first reaches the yield point for the section in the figure above. Assume the concrete to remain linear elastic. Check to see if the concrete actually remains linear elastic (Hint: does the stress in compression concrete exceed $0.5f'_c$). Ignore tension in concrete.

answer: ? in-kips

III. A rectangular beam made using concrete with compressive strength f'_c = 4,000 psi and steel with f_y = 60,000 psi has width b = 24 in., total depth h = 18 in., and effective depth d = 15.5 in. Concrete modulus of rupture f_r = 475 psi. The elastic modulus of the steel and concrete are, respectively 29,000 ksi and 3,600 ksi. The tensile steel is 5 No. 11 bars.

(1) Find the maximum service moment that can be resisted without stressing the concrete higher than $0.5f'_c$ or the steel 0.40 f_y.

(2) Determine whether this beam will show flexural cracking before reaching the service load calculated in (a).