HOMEWORK SET 4A

I. Calculate the moment when the tension crack has progressed
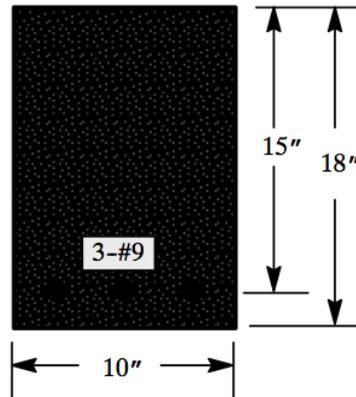   (1) 3.0 inches   *answer:* _____ *? in-kips* _____
   (2) 3.5 inches   *answer:* _____
   (3) 5.0 inches   *answer:* _____ 335 in-kips
   (4) 6.0 inches   *answer:* _____
   from the bottom of the cross–section shown below.

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. <u>Assume the concrete to remain linear elastic.</u> Check to see if the concrete actually remains linear elastic (Hint: does the stress in compression concrete exceed 0.5f'$_c$). <u>Ignore tension in concrete.</u>

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).