Assignment No. 5 (100 pts.) - Beam Flexure – Doubly Reinforced Sections and T-Beams

4.5 Find $\phi$ $M_n$ and check $A_s,\text{min}$ for T-beam below:

$B_f = 48\"$, $b_w = 12\"$, $h = 22\"$ (top of slab to bottom of web), $d = 19\"$, $t_f = 6\"$, $f_{c'} = 4.5$ ksi; $f_y = 60$ ksi, 6#8 bars ($A_s = 6*0.79\text{ in}^2$)

4.6 Find $\phi$ $M_n$ and check $A_s,\text{min}$ for T-beam below:

(a) $B_f = 20\"$, $b_w = 10\"$, $h = 22\"$ (top of slab to bottom of web), $d = 18.5\"$, $t_f = 5\"$, $f_{c'} = 4.0$ ksi; $f_y = 60$ ksi, 6#8 bars ($A_s = 6*0.79\text{ in}^2$)

(b) Same as (a) except 6#9 bars ($A_s = 6*1.0\text{ in}^2$)

4.9 Find $\phi$ $M_n$ and check $A_s,\text{min}$ for Tube section below:

(a) $A_s = 6#8$ bars ($6*0.79 = 4.74\text{ in}^2$), $f'c = 3.5$ ksi, $f_y = 60$ ksi

(b) $A_s = 9#8$ bars ($9*0.79 = 7.11\text{ in}^2$), $f'c = 3.5$ ksi, $f_y = 60$ ksi

(c) $A_s = 9#10$ bars ($9*1.27 = 11.43\text{ in}^2$), $f'c = 3.5$ ksi, $f_y = 60$ ksi

4.11 Find $\phi$ $M_n$ for rectangular beam below (doubly reinforced):

(a) $b = 12\"$, $d=32.5\"$, $f_{c'} = 4.0$ ksi; $f_y = 60$ ksi, 6#9 bars ($A_s = 6*1.0\text{ in}^2$) tension

(b) Same as (a) except with 2#9 bars in compression ($d' = 2.5\"$)

(c) Same as (a) except with 4#9 bars in compression ($d' = 3.5\"$)