| CE 123M | PROBLEM 1 | MID TERM 1<br>FALL 2017 |
|---|---|---|

a- SEE PLAN

b SUM DEAD = 5
15
20

LIVE = 15
50
80
145

c SELF WT = $\frac{6}{12} \times 150 = 75$ PSF

d $W_D = 75 + 20 = 95$ PSF

e $W_L = 145$ PSF

f BM SELF WT = $\frac{18" \times 16"}{144 \frac{in^2}{ft^2}} \times 150$ PCF = 300 PLF

g. FACTORED DEAD IN COMBO W/ LIVE (1.2D + 1.6L)

$W_{uD} = (12' \times 95 PSF + 300 PLF) \times 1.2 = 1.73$ K/I

h $W_{LL} = \frac{12' \times 145 PSF}{1000} \times 1.6 = 2.78$ K/I

i FACTORED DEAD IN COMBO W/ LIVE (1.2D + 1.6L)

$P_{uD} = 1.734 K/I \times 28' = 48.4$ K

j $P_{uL} = 2.78$ K/I $\times 28' = 77.8$ K

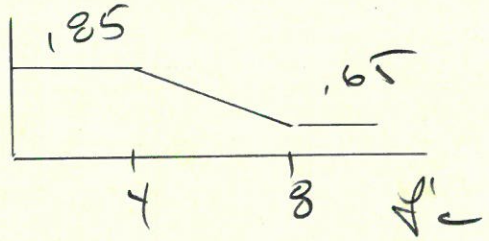
# PROBLEM 2

a $f_r = 7.5\sqrt{6000} = 581$ psi

b $E_c = 57\sqrt{6000} = 4415$ ksi

c $E_s = 29{,}000{,}000$ psi

d $\beta_1 = 0.75$




e $b_w = 36$

f) $d = 48" - 1.5" - \frac{5}{8}" - \frac{1.27}{2} - 1.5 = 43.74"$

g) $A_s = 10 \times 1.27 = 12.70^{in^2}$

h) $A_{s\,min}$ = lesser of

$\frac{3\sqrt{6000}}{60000} \times 36 \times 43.74 = 6.10^{in^2}$ controls

$\frac{200}{60000} \times$ " " $= 5.20^{in^2}$

i $A_{s\,MAX} = \frac{0.36 \times 0.75 \times 36 \times 43.74 \times 6000}{60{,}000} = 42.52^{in^2}$

j) yes

k - CLEAR DIST $= \frac{36" - (2 \times (1.5 + .625) - 5 \times 1.27}{4} = 6.35"$

l $s_{min}$ = lesser of: $1.27"$, $1"$, $4/3\ d_{agg} = 1"$

m yes

| GE1BN | PROBLEM 2 | FALL 2017 MID-TERM 1 |
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n $s = \frac{36" - 2(1.5+.625) - 1.27}{4} = 7.62"$

o $c_c = 1.5 + .625 = 2.125"$

p $s_{MAX} =$ lesser of $\left| \begin{array}{l} 15 \times \frac{40{,}000}{4000} - 2.5 \times 2.125 = 9.69" \\ 12 \times " = 12" \end{array} \right.$

q yes

r yes As $h > 36"$

s same as e p), $s = 9.69"$

| CE123N | PROBLEM 3 | FALL 2017 MIDTERM 1 |
|---|---|---|

a) h min $p_{min} / \rho_n = \ell / 16 = \frac{52' \times 12''}{16} = 39''$

b) $a_s = 15.24$
$b_w = 36$
$d = 43$
$f'_c = 6$
$f_y = 60$

$M_n = 37035^{k\cdot in}$
$= 3086^{k\cdot ft}$

c) $c = \frac{A_s f_y}{.85 f'_c \beta_1 b_w} = \frac{15.24 \times 60}{.85 \times 6 \times .75 \times 36} = 6.64''$

d) $\epsilon_c = 0.003$

e) $\epsilon_s = 0.003 \left( \frac{43}{6.64} - 1 \right) = 0.016$

f) $\phi = 0.90$

g) $3' \times 4' \times .15^{k/ft^3} = 1.80^{k/ft}$

h) $w\ell^2/8$ @ CENTER

i) $P\ell/4$ " "

j) $M_{u_D} = 1.2 \times 3.0 \times 52^2/8 = 1217^{k\cdot ft}$
$M_{u_L} = 1.6 \times 100 \times 52/4 = \underline{2080^{k\cdot ft}}$
$3277^{k\cdot ft}$

$4030 - 3277 = 733^{k\cdot ft}$

$\frac{733^{k\cdot ft} \times 8}{1.6 \times 52'^2} = 1.36^{k/ft}$

| CE123N | PROBLEM 3 | FALL 2017 MIDTERM 1 |
|---|---|---|

K $M_u = 5000^{K\text{-}}$

$= 60000^{KN}$

$\frac{M_u}{4d} = \frac{5000}{4 \times 43} = 29.07^{in^2}$

$\frac{M_u}{4} = \frac{60000}{0.9} = 66{,}667^{KN}$

$b_w = 36$

$d = 43$

$f'_c = 6$

$f_y = 60$

$A_s = 29.06^{in^2}$