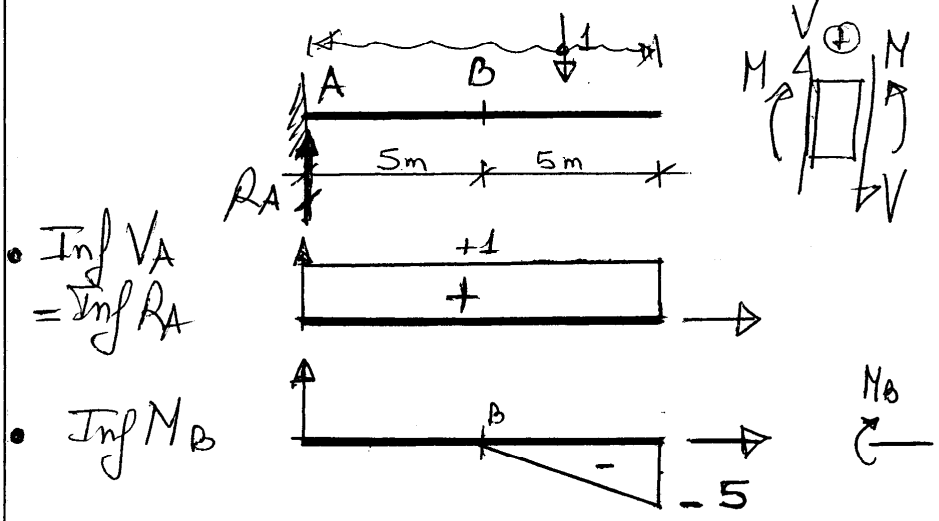
FE 1

Refer to Question Sheet for Problems & Instructions

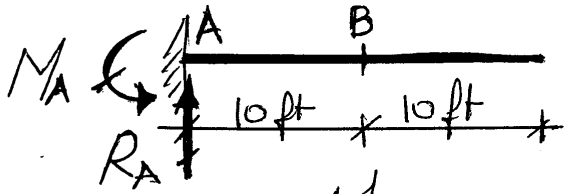
Problem 6-5 (+Solve with SAP2000)



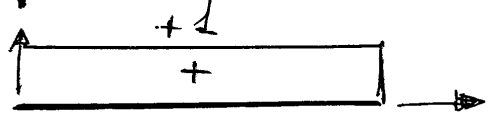
- Inf V_A = Inf R_A

- Inf M_B

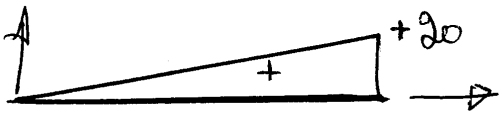
Problem 6-13



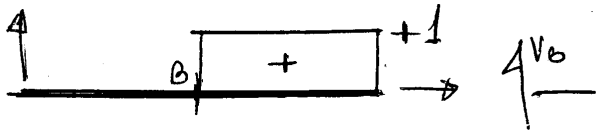
- Inf R_A (↑)



- Inf M_A (↻)

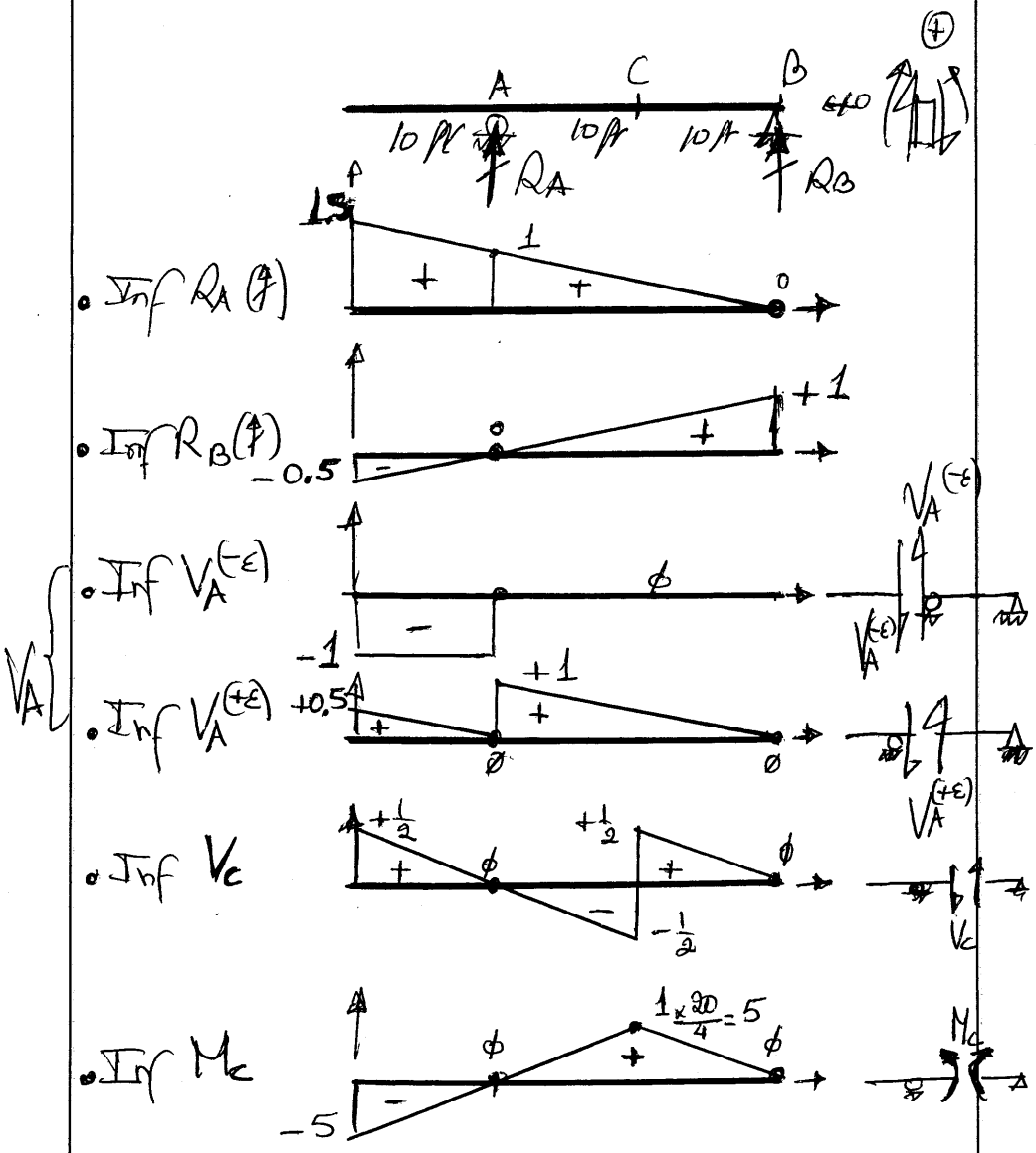


- Inf V_B



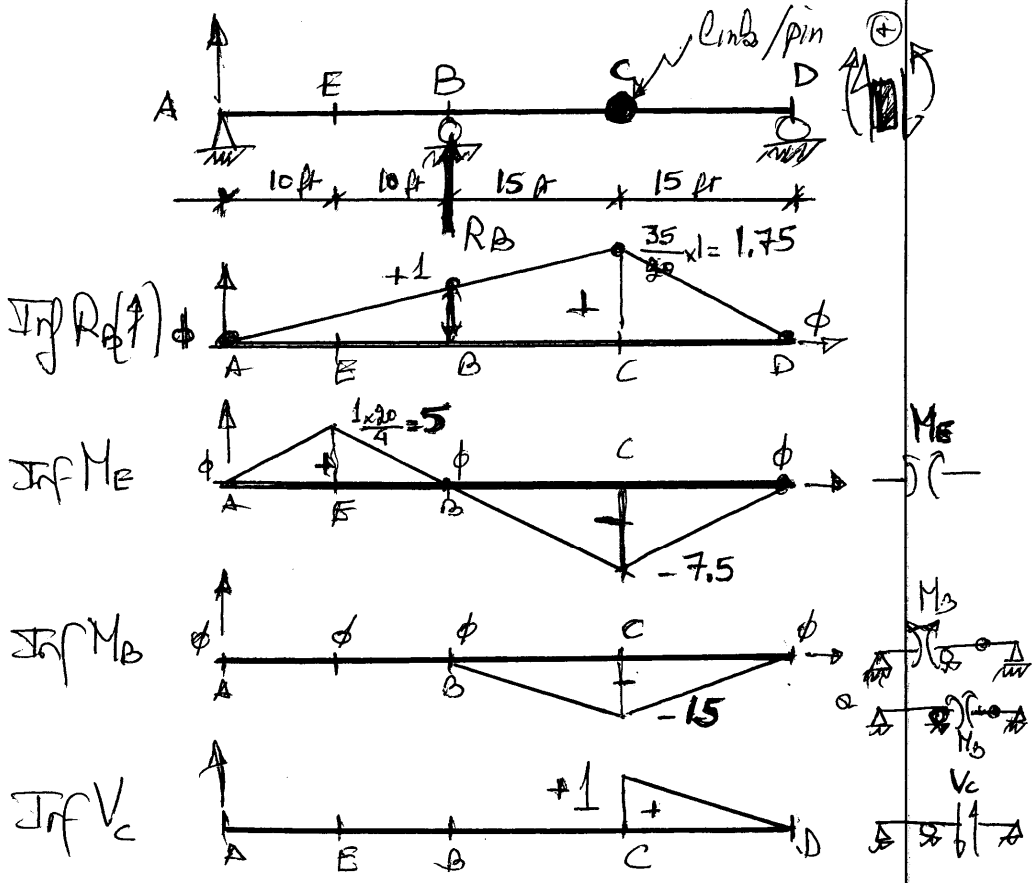
FE 1

Problem 6-7 (Add R_B & V_A ; + SAP2000)



FE 1

Problem 6-21 (Add M_B & V_C ; + SAP2000)



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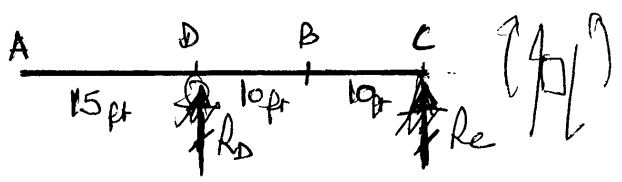
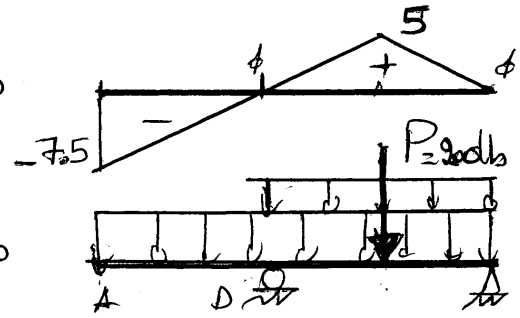
FE 1

Problem 6-27 (Add V_D & $w_D < \begin{matrix}1000\ lb/ft \\ 100\ lb/ft\end{matrix}$)

$w_D = < \begin{matrix}1000\ lb/ft \\ 100\ lb/ft\end{matrix}$
$w_L = 60\ lb/ft$
$P_L = 200\ lb$



• Inf M_B



Max $\oplus M_B$

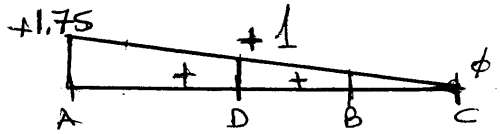
$w_D = 1000$ $\quad \oplus M_B = 1000\left(-\frac{1}{2}\times 7.5\times 15 + \frac{1}{2}\times 5\times 20\right) + 60\left(\frac{1}{2}\times 5\times 20\right) + 200\times 5$ $\rightsquigarrow -6{,}250 + 4{,}000$

$= -6{,}250 + 4000 = \ominus 2{,}250\ lb\cdot ft$

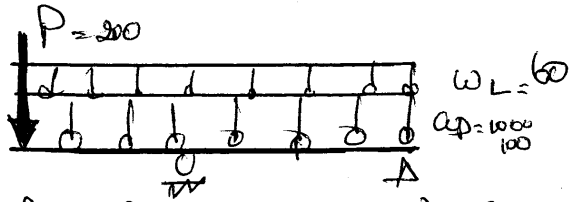
(No positive M_B)

$w_D = 100$ $\quad \oplus M_B = -625 + 4000 = \oplus 3{,}375\ lb\cdot ft$

• Inf R_D



Max $\oplus R_D$

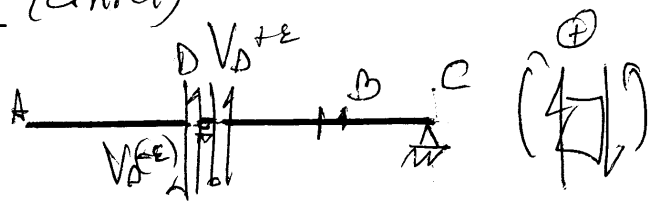


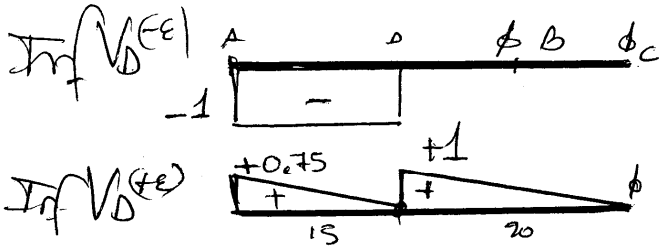
$w_D = 1000$ $\quad \oplus R_D = \left(1000 + 60\right)\left(\frac{1.75\times 35}{2}\right) + 200\times 1.75 = \oplus 32{,}813\ lb$

$w_D = 100$ $\quad \oplus R_D = (100+60)\times$ ~ + ^ $= \oplus 5{,}250\ lb$

FE 1

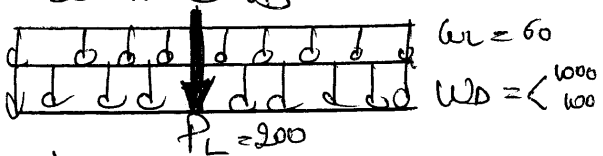
Problem 6-27 (Cont'd)





$V_D^{(-\varepsilon)} < 0$ So no ⊕ $V_D^{(-\varepsilon)}$

Max $V_D^{(+\varepsilon)}$

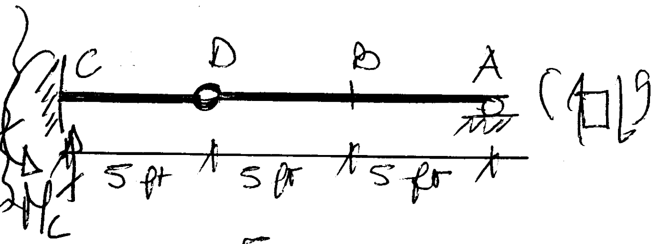


- $w_D = 1000$ $V_D^{(+\varepsilon)} = 1060 \times (\frac{1}{2} \times 0.75 \times 15 + \frac{1}{2} \times 1 \times 20) + 200 \times 1 = 16,762.5$ lbs
- $w_D = 100$ $V_D^{(+\varepsilon)} = 160 (\quad) + 200 \times 1 = 2700$ lbs

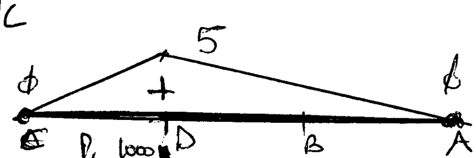
FE 1

Problem 6-28 (Add $P_{Live} = 1000$ lbs; SAP2000)

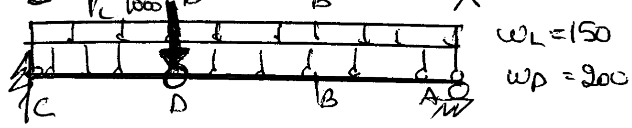
$w_D = 200$ lb/ft
$w_L = 150$ lb/ft
$P_L = 1000$ lb



- Inf M_C (Reaction)



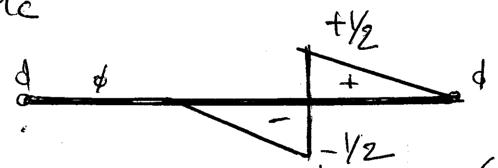
Max ⊕ M_C



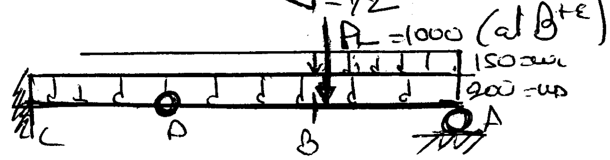
$$= (200 + 150) \times \left(\tfrac{1}{2} \times 5 \times 15\right) + 1000 \times 5$$
$$= 18{,}125 \text{ lb-ft}$$

No Max ⊖ M_C

- Inf V_B



Max ⊕ V_B



$$= \text{"}\cancel{w_D}\nearrow 0\text{"} + 150\left(\tfrac{1}{2} \times \tfrac{1}{2} \times 5\right) + 1000 \times \tfrac{1}{2}$$
$$= +687.5 \text{ lb}$$

Max ⊖ V_B by inspection since "$\cancel{w_D}\nearrow 0$"

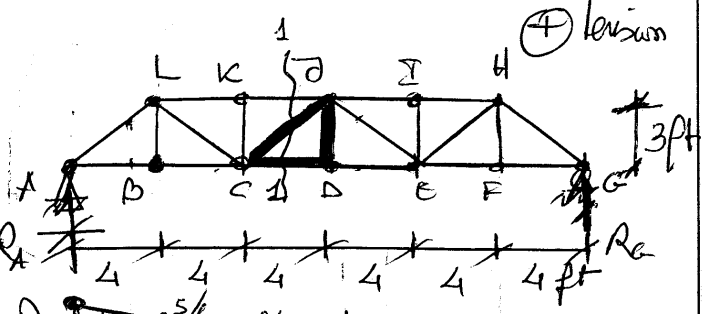
$$= -687.5 \text{ lbs}$$ (w_L between D & B + P_L @ $B^{-\varepsilon}$)

FE 1

Problem 6-48 (Add R_A & F_{CD}; + SAP2000)

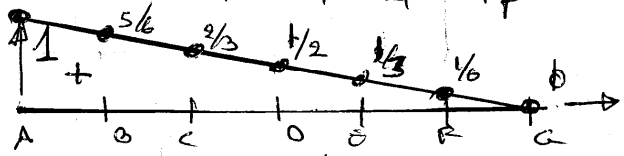
Load 1(D)

A-B-C-D-E-F-G

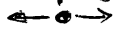


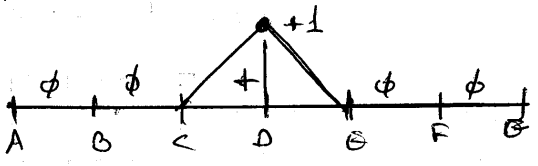
+ Tension

- Inf R_A(1)

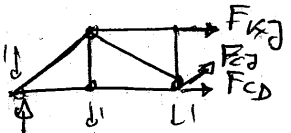


- Inf F_{DJ}



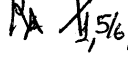


Section 1-1

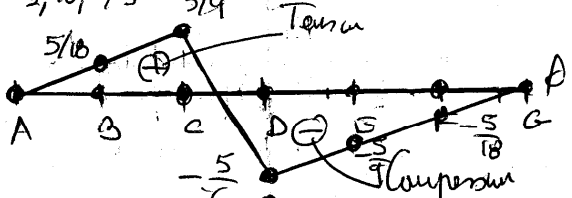


$\Sigma F_y = 0 \rightarrow F_{CJ}$

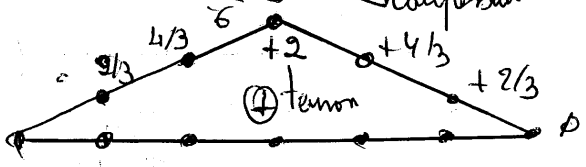
$\Sigma M_J = 0 \rightarrow F_{CD}$



- Inf F_{CJ}



- Inf F_{CD}

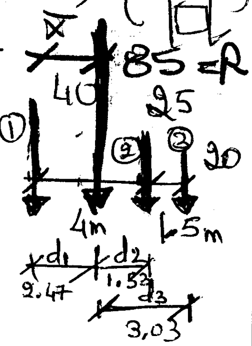


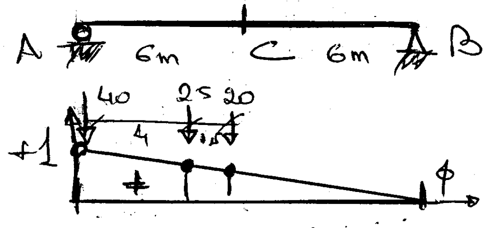
FE1

Problem 6-73 (Add $V_{(abs)\,max}$, $R_{A\,max}$, M_C)

$\overline{X} = \dfrac{25 \times 4 + 20 \times 5.5}{85}$

$\overline{X} = 2.47\ m$





- Inf R_A = Inf V_A

$\text{Max} \oplus R_A = \text{Max} \oplus V_A = 40 \times (1) + 25 \times \left(\frac{8}{12}\right) + 20 \times \left(\frac{6.5}{12}\right)$

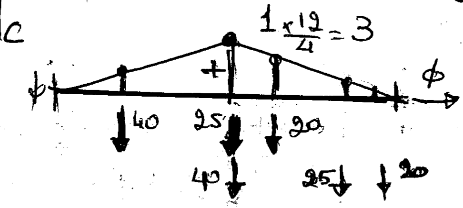
$= 67.5\ kNm$

- $|\text{Max } V_{(abs)} = \text{Max} \oplus V_A| = 67.5\ kNm$

(> Max ⊕ V_B if one direction →
(= Max ⊕ V_B if two directions ⇄)

- Inf M_C

$1 \times \frac{12}{4} = 3$



Position ①
Position ②

$M_{max(abs)} = M_{2\,max} > M$
$= 164.2 > M_{C\,max}$
slightly higher

$\oplus M_C$ ① $= 40 \times \left(\frac{2}{6} \times 3\right) + 25 \times (3) + 20 \times \left(\frac{4.5}{6} \times 3\right) = 160\ kNm$ (max)

$\oplus M_C$ ② $= 40 \times (3) + 25 \times \left(\frac{2}{6} \times 3\right) + 20 \times \left(\frac{0.5}{6} \times 3\right) = 150\ kNm$

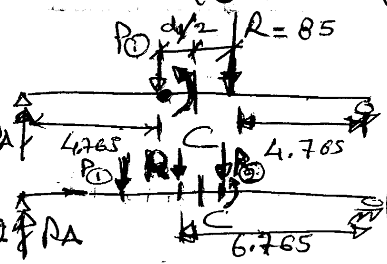
- Max $M_{(abs)}$

$P_① \rightarrow \frac{d_1}{2} = 1.235\ m$

$R_A = 85 \times \frac{4.765}{12} = 33.75\ R_A$

$P_② \rightarrow \frac{d_2}{2} = 0.765\ m$

$R_A = 85 \times \frac{6.765}{12} = 47.92\ R_A$



$M_{1\,max} = 33.75 \times 4.765$
$= 160.8\ kNm$

$M_{2\,max} = 47.92 \times 6.765 - 40 \times 4$
$= 164.2\ kNm$