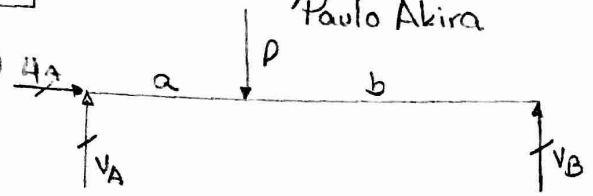
Lista 2

Paulo Akira

1) a)



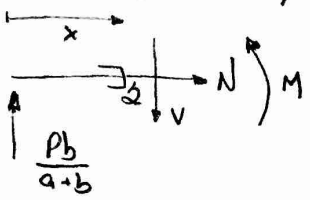
$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 \cdot V_A + V_B = P$

$\Sigma M_{(A)} = 0 \cdot -Pa + V_B(a+b) = 0 \Rightarrow \boxed{V_B = \frac{Pa}{a+b}}$

$V_A = P - V_B = \frac{Pa+Pb-Pa}{a+b} \Rightarrow \boxed{V_A = \frac{Pb}{a+b}}$

trecho 1 : $(0 < x < a)$

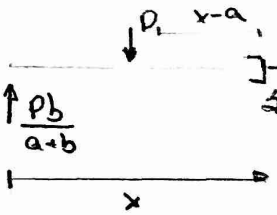


$N = 0$

$V = \frac{Pb}{a+b}$

$M - \frac{Pb}{a+b}x = 0 \Rightarrow M = \frac{Pb}{a+b}x$

trecho 2 : $(a < x < a+b)$



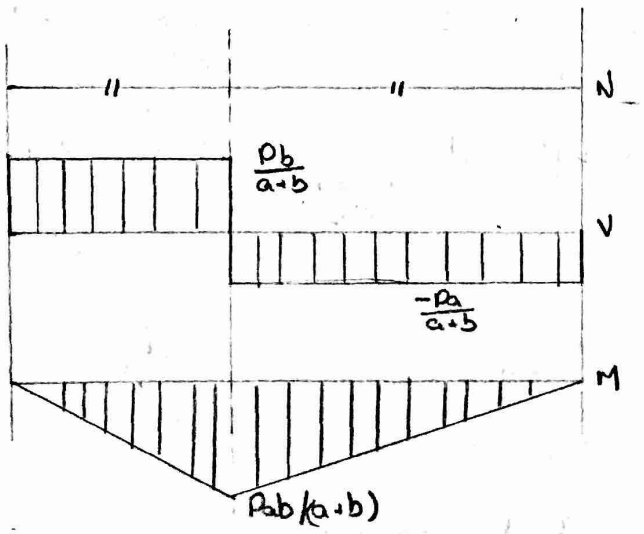
$N = 0$

$-V + \frac{Pb}{a+b} - P = 0$

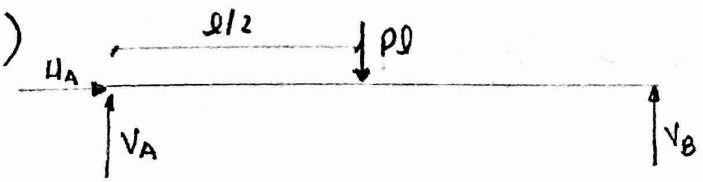
$\Rightarrow V = \frac{Pb}{a+b} - P = \frac{-Pa}{a+b}$

$M + \frac{Pb}{a+b}x + P(x-a) = 0 \Rightarrow M = \frac{Pbx}{a+b} - Px + Pa = 0$

$\Rightarrow M = \left(\frac{b}{a+b} - 1\right)Px + Pa = -\frac{Pax + Pa^2 + Pab}{a+b}$



b)

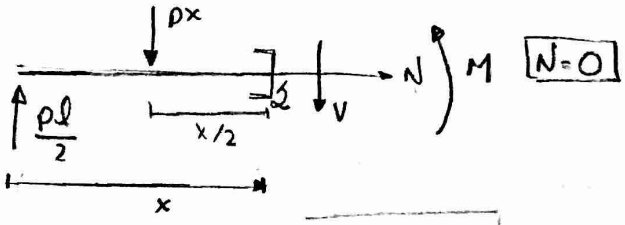


$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 \cdot V_A + V_B = Pl$

$\Sigma M_{(A)} = 0 \cdot -\frac{Pl^2}{2} + V_B \cdot l = 0 \Rightarrow \boxed{V_B = \frac{Pl}{2}}$

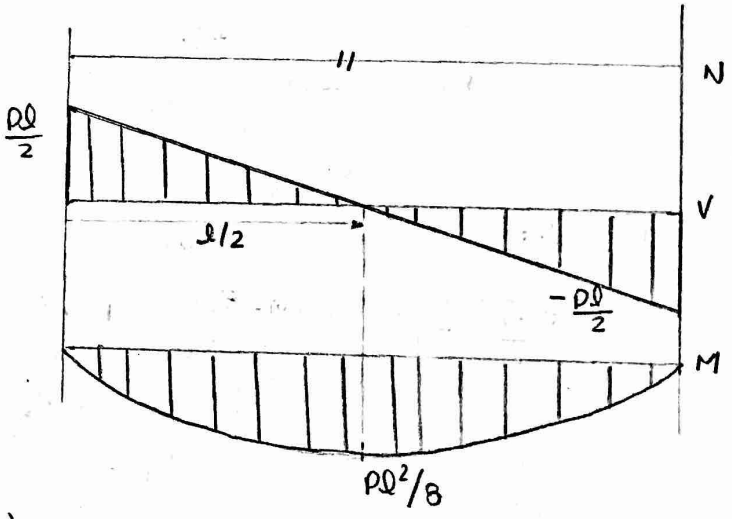
$V_A = Pl - \frac{Pl}{2} \Rightarrow \boxed{V_A = \frac{Pl}{2}}$



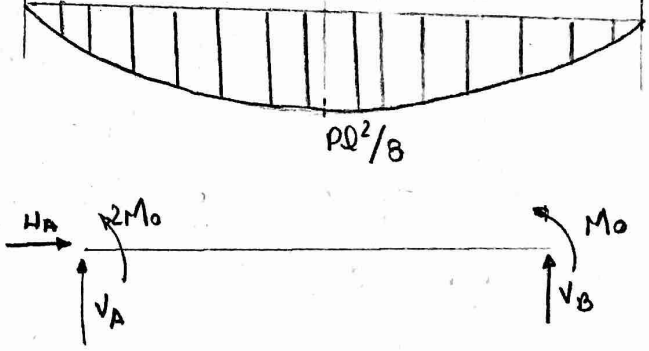
$N = 0$

$-V - Px + \frac{Pl}{2} = 0 \Rightarrow \boxed{V = -Px + \frac{Pl}{2}}$

$M - \frac{Plx}{2} + \frac{Px^2}{2} = 0 \Rightarrow M = -\frac{Px^2}{2} + \frac{Plx}{2}$



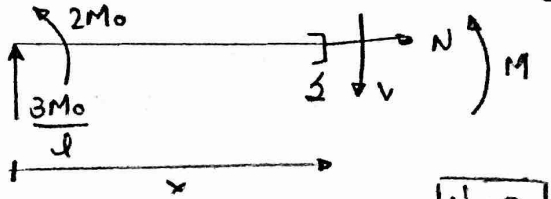
c)



$H_A = 0$

$V_A + V_B = 0$

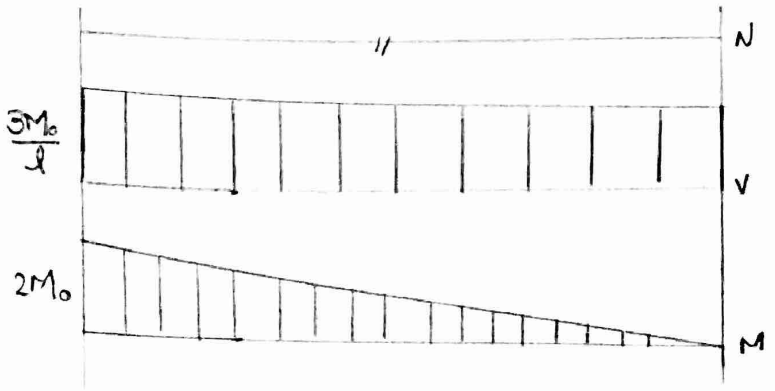
$2M_o + M_o + V_B \cdot l = 0 \Rightarrow \boxed{V_B = -\frac{3M_o}{l}} \quad \boxed{V_A = \frac{3M_o}{l}}$



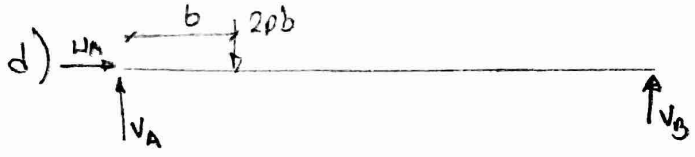
$\boxed{N = 0}$

$-V + \frac{3M_o}{l} = 0 \Rightarrow \boxed{V = \frac{3M_o}{l}}$

$M - \frac{3M_o}{l}x + 2M_o = 0 \Rightarrow \boxed{M = \frac{3M_o x}{l} - 2M_o}$



d)



$H_A = 0$

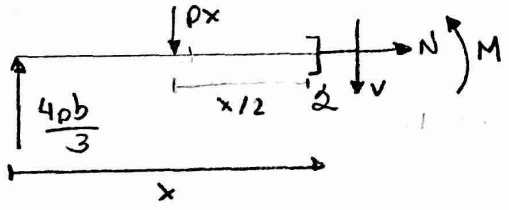
$V_A - 2pb + V_B = 0 \Rightarrow V_A + V_B = 2pb$

$-2pb^2 + V_B\, 3b = 0 \Rightarrow 3b\, V_B = 2pb^2 \Rightarrow$

$\Rightarrow \boxed{V_B = \frac{2pb}{3}} \quad V_A = \frac{6pb - 2pb}{3} \Rightarrow$

$\Rightarrow \boxed{V_A = \frac{4pb}{3}}$

Trecho 1: $(0 < x < 2b)$

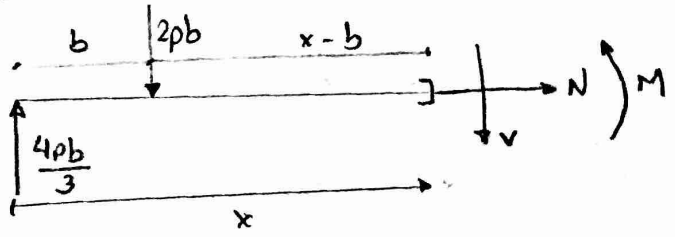


$\boxed{N = 0}$

$-V + \frac{4pb}{3} - px = 0 \Rightarrow \boxed{V = \frac{4pb}{3} - px}$

$M + \frac{px^2}{2} - \frac{4pbx}{3} = 0 \Rightarrow \boxed{M = -\frac{px^2}{2} + \frac{4pbx}{3}}$

Trecho 2: $(2b < x < 3b)$

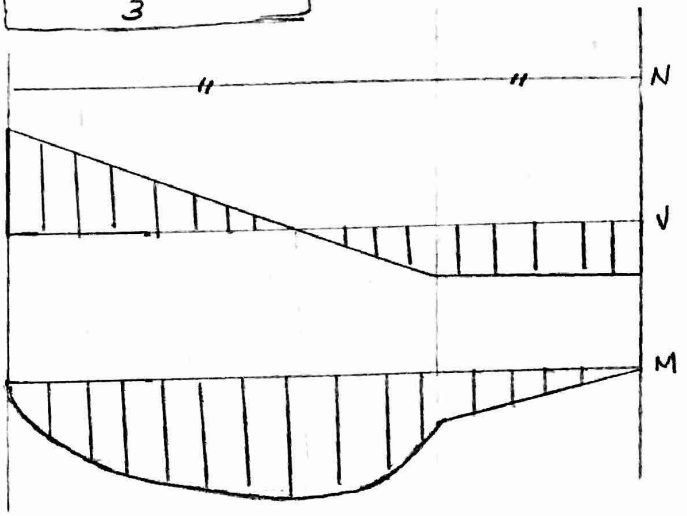


$\boxed{N = 0}$

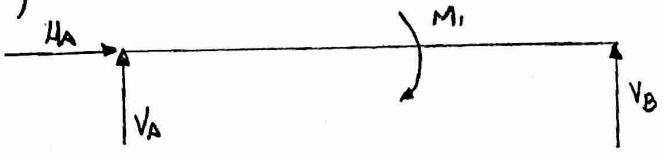
$-V + \frac{4pb}{3} - 2pb = 0 \Rightarrow \boxed{V = -\frac{2pb}{3}}$

$M + 2pbx - 2pb^2 - \frac{4pbx}{3} = 0 \Rightarrow$

$\Rightarrow \boxed{M = -\frac{2pbx}{3} + 2pb^2}$



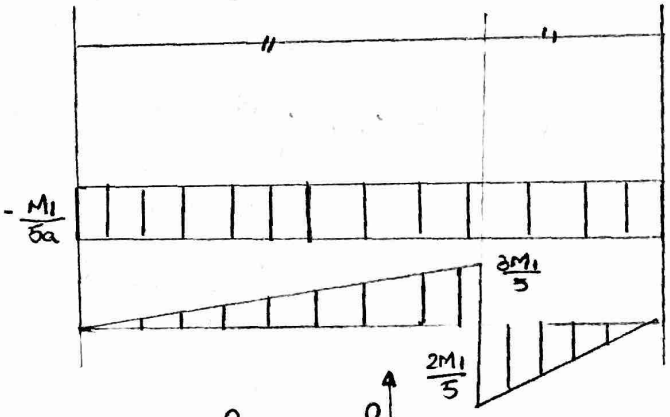
e)



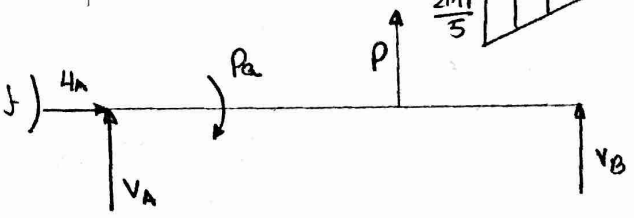
$H_A = 0$

$V_A = -V_B$

$-M_1 + 5V_B\, a = 0 \Rightarrow \boxed{V_B = \frac{M_1}{5a}} \quad \therefore \boxed{V_A = -\frac{M_1}{5a}}$



f)



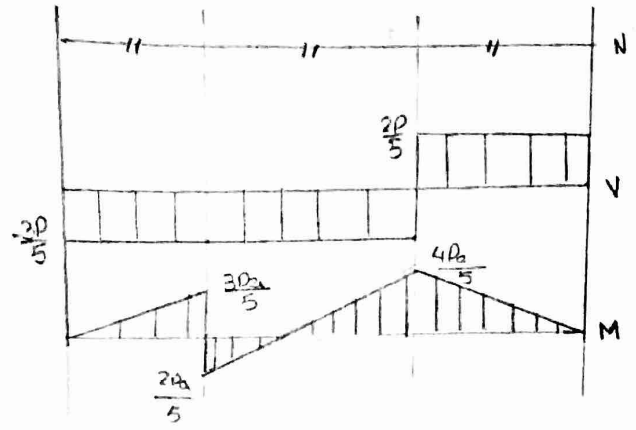
$H_A = 0$

$V_A + V_B = P$

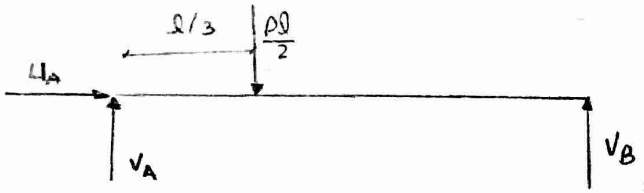
$-Pa + 3Pa + 5aV_B = 0 \Rightarrow$

$\Rightarrow 5aV_B = -2Pa \Rightarrow \boxed{V_B = -\frac{2P}{5}}$

$V_A - \frac{2P}{5} = P \Rightarrow \boxed{V_A = \frac{-3P}{5}}$



g)

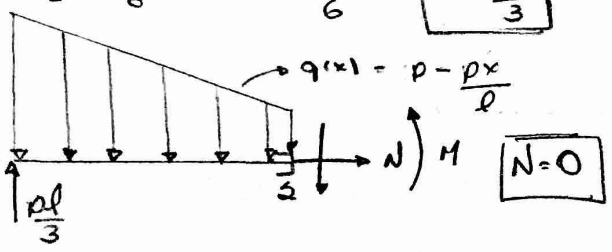


$H_A = 0$

$V_A - \frac{pl}{2} + V_B = 0 \Rightarrow V_A + V_B = \frac{pl}{2}$

$\sum M_{(A)} = 0 : -\frac{pl}{2}\cdot\frac{l}{3} + V_B\, l = 0 \Rightarrow \boxed{V_B = \frac{pl}{6}}$

$V_A = \frac{pl}{2} - \frac{pl}{6} \Rightarrow V_A = \frac{2pl}{6} \Rightarrow \boxed{V_A = \frac{pl}{3}}$



$\boxed{N = 0}$

$\frac{dV}{dx} = -q(x) \Rightarrow \frac{dV}{dx} = p - \frac{px}{l} \Rightarrow V = -\int p - \frac{px}{l}\, dx \Rightarrow$

$\Rightarrow V = -px + \frac{px^2}{2l} + C_1$

para $x = 0$, $V(0) = \frac{pl}{3}$: $\boxed{V = -px + \frac{px^2}{2l} + \frac{pl}{3}}$

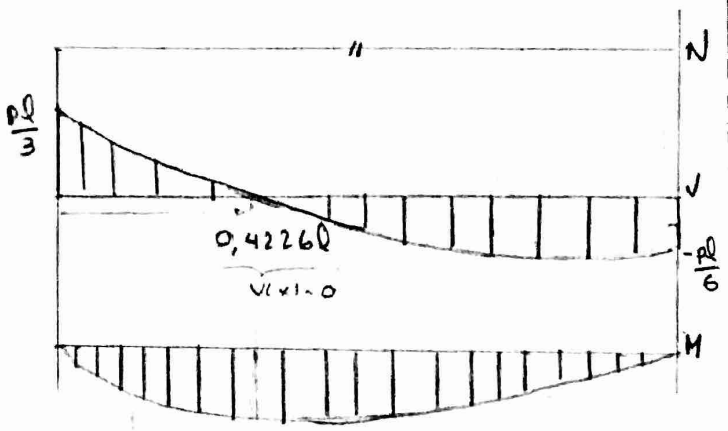
$\frac{dM}{dx} = V \Rightarrow \frac{dM}{dx} = -px + \frac{px^2}{2l} + \frac{pl}{3} \Rightarrow$

$\Rightarrow M = \int -px + \frac{px^2}{2l} + \frac{pl}{3}\, dx \Rightarrow$

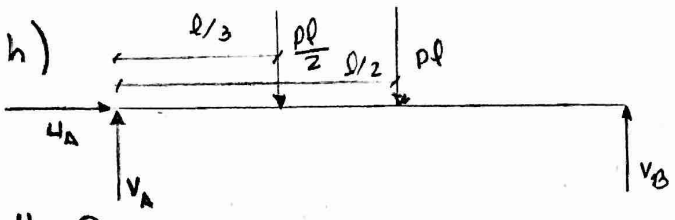
$\Rightarrow M = -\frac{px^2}{2} + \frac{px^3}{6l} + \frac{plx}{3} + C_2$

para $x = 0$, $M(0) = 0$

$$\boxed{M = -\frac{px^2}{2} + \frac{px^3}{6l} + \frac{plx}{3}}$$



h)



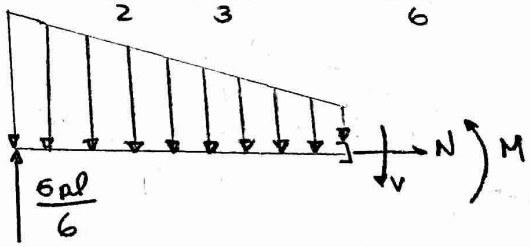
$H_A = 0$

$V_A - \frac{pl}{2} - pl + V_B = 0 \Rightarrow V_A + V_B = \frac{3pl}{2}$

$\sum M_{(A)} = 0 : -\frac{pl}{2}\cdot\frac{l}{3} - pl\,\frac{l}{2} + V_B\, l = 0 \Rightarrow$

$\Rightarrow V_B = \frac{pl}{6} + \frac{pl}{2} = \frac{4pl}{6} \Rightarrow V_B = \frac{2pl}{3}$

$\therefore V_A = \frac{3pl}{2} - \frac{2pl}{3} \Rightarrow V_A = \frac{5pl}{6}$



$N = 0$

$q(x) = 2p - \frac{px}{l}$

$\frac{dV}{dx} = -q(x) \Rightarrow V = \int \frac{px}{l} - 2p\, dx = \frac{px^2}{2l} - 2px + C_3$

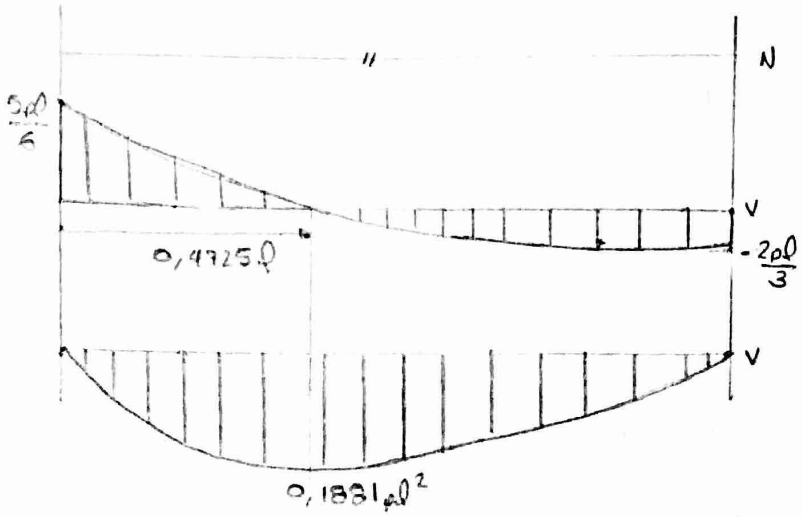
para $x = 0$, $V(0) = \frac{5pl}{6}$: $\boxed{V = \frac{px^2}{2l} - 2px + \frac{5pl}{6}}$

$\frac{dM}{dx} = V \Rightarrow M = \int \frac{px^2}{2l} - 2px + \frac{5pl}{6}\, dx \Rightarrow$

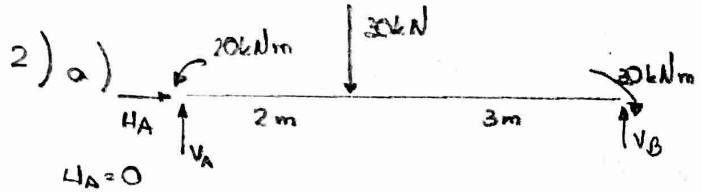
$\Rightarrow M = \frac{px^3}{6l} - px^2 + \frac{5plx}{6} + C_2$

para $x = 0$, $M(0) = 0$

$$\boxed{M = \frac{px^3}{6pl} - px^2 + \frac{5plx}{6}}$$



2) a)



$H_A = 0$

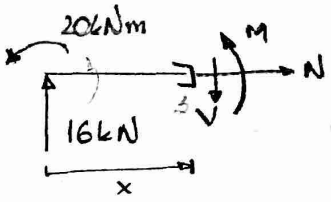
$V_A + V_B = 30$

$\sum M_{(A)} = 0 : 20 - 30 - 30 \cdot 2 + 5V_B = 0 \Rightarrow$

$\Rightarrow -10 - 60 + 5V_B = 0 \Rightarrow \boxed{V_B = 14\ kN}$

$V_A = 30 - V_B \Rightarrow \boxed{V_A = 16\ kN}$

Trecho 1 $(0 < x < 2m)$

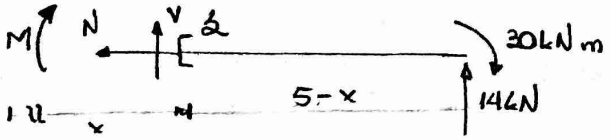


$N = 0$

$V = 16\ kN$

$M = -20 + 16x$

Trecho 2: $(2 < x < 5m)$

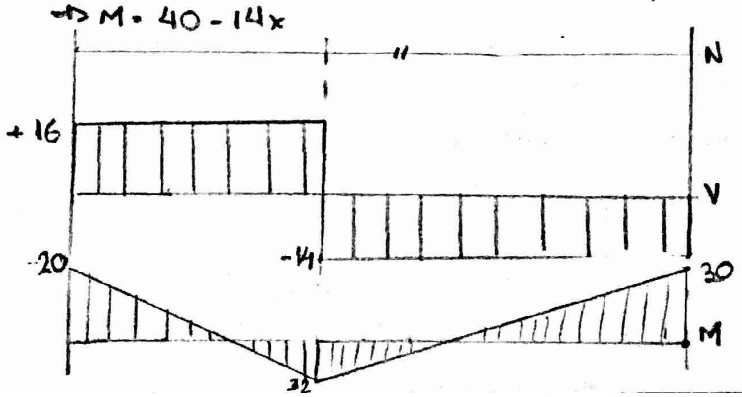


$N = 0$

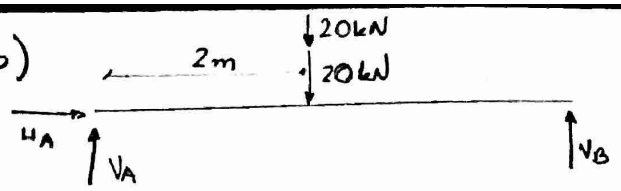
$V + 14 = 0 \Rightarrow V = -14$

$-M - 30 + 14(5 - x) = 0 \Rightarrow M = -30 + 70 - 14x \Rightarrow$

$\Rightarrow M = 40 - 14x$



b)



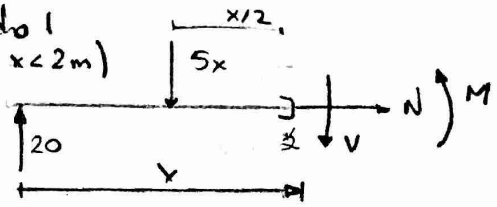
$H_A = 0$

$V_A + V_B = 40$

$\sum M_{(A)} = -20 \cdot 2 - 20 \cdot 2 + V_B \, 4 = 0 \Rightarrow$

$\Rightarrow 4V_B = 80 \Rightarrow V_B = 20\ kN \therefore V_A = 20kN$

Trecho 1 $(0 < x < 2m)$



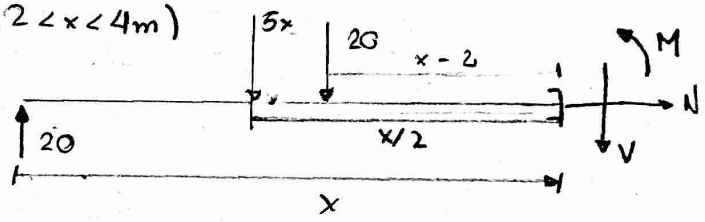
$N = 0$

$20 - 5x - V = 0 \Rightarrow V = 20 - 5x$

$M - 20x + \frac{5x^2}{2} = 0 \Rightarrow M = -\frac{5x^2}{2} + 20x$

Trecho 2

$(2 < x < 4m)$



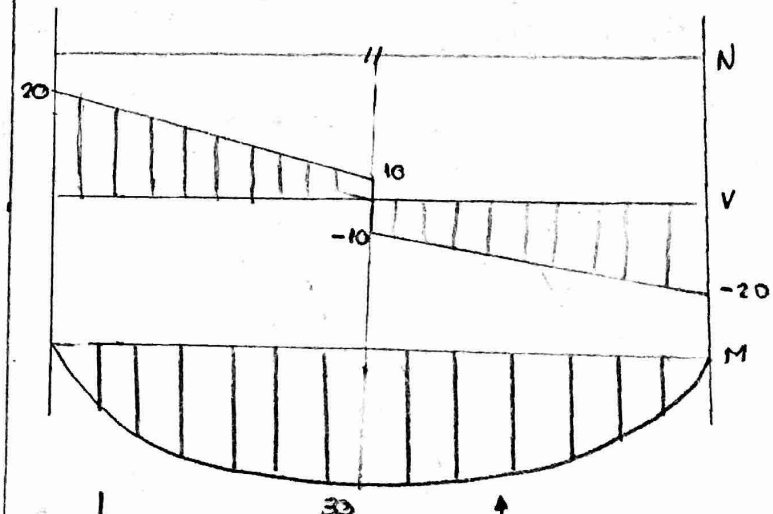
$N = 0$

$-V + 20 - 5x - 20 = 0 \Rightarrow V = -5x$

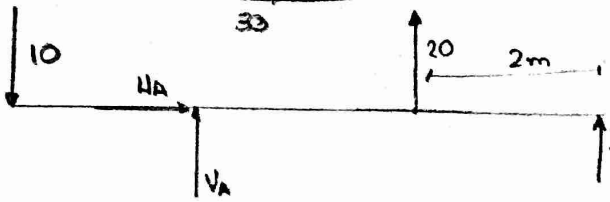
$M - 20x + \frac{5x^2}{2} + 20(x - 2) = 0 \Rightarrow$

$\Rightarrow M - 20x + \frac{5x^2}{2} + 20x - 40 = 0 \Rightarrow$

$\Rightarrow M = -\frac{5x^2}{2} + 40$



c)



$H_A = 0$

$V_A + V_B - 10 + 20 = 0 \Rightarrow V_A + V_B = -10$

$\Sigma M_{(A)} = 0 \quad 10 \cdot 2 + 20 \cdot 2 + V_B \cdot 4 = 0 \Rightarrow$

$\Rightarrow 4V_B = -60 \Rightarrow V_B = -15\,kN$

$V_A = 5\,kN$

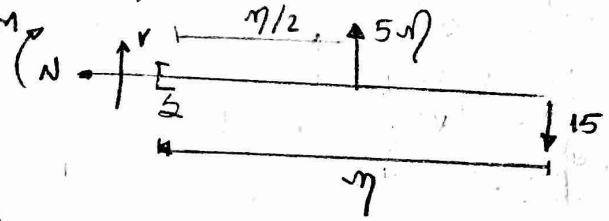
trecho 1 : $(0 < x < 2m)$

$N = 0$

$V = -10\,kN$

$M + 10x = 0 \Rightarrow M = -10x$

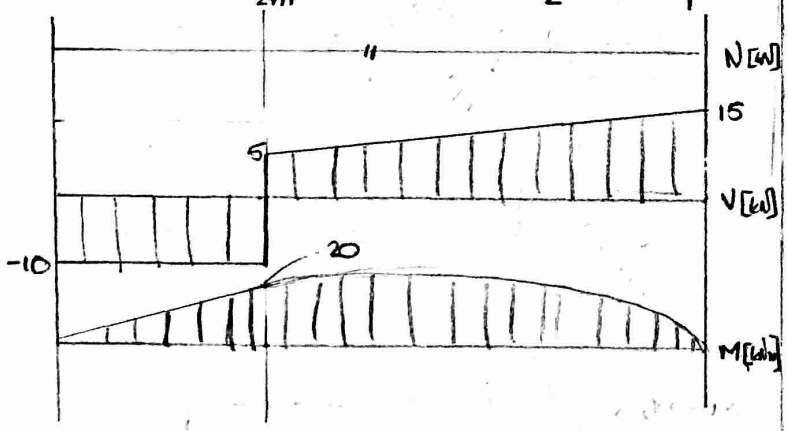
trecho 2 : $(0 < \eta < 4m)$



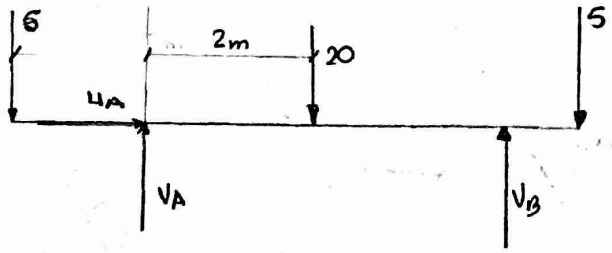
$N = 0$

$V = 15 - 5\eta$

$-M - 15\eta + \frac{5\eta^2}{2} = 0 \Rightarrow M = \frac{5\eta^2}{2} - 15\eta$



d)



$H_A = 0$

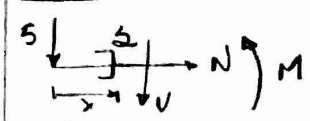
$V_A + V_B = 30$

$\Sigma M_{(A)} = 0 : 5 \cdot 1 - 20 \cdot 2 + 4V_B - 5 \cdot 5 = 0 \Rightarrow$

$\Rightarrow 5 - 40 - 25 + 4V_B = 0 \Rightarrow V_B = 15$

$V_A = 15$

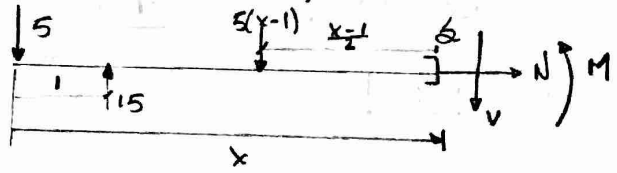
trecho 1 : $(0 < x < 1m)$



$V = -5$ $\quad N = 0$

$M + 5x = 0 \Rightarrow M = -5x$

trecho 2 : $(1 < x < 5)$



$-V - 5 + 15 - 5(x-1) = 0 \Rightarrow V = 10 - 5x + 5 \Rightarrow$

$V = 0 \Rightarrow x = 3$

$\Rightarrow V = -5x + 15$ $\quad N = 0$

$M + 5x - 15(x-1) + \frac{5(x-1)^2}{2} = 0 \Rightarrow$

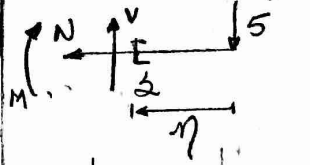
$\Rightarrow M - 10x + 15 + 2{,}5(x^2 - 2x + 1) = 0 \Rightarrow$

$\Rightarrow M - 10x + 17{,}5 + 2{,}5x^2 - 5x = 0 \Rightarrow$

$\Rightarrow M = -2{,}5x^2 + 15x - 17{,}5$

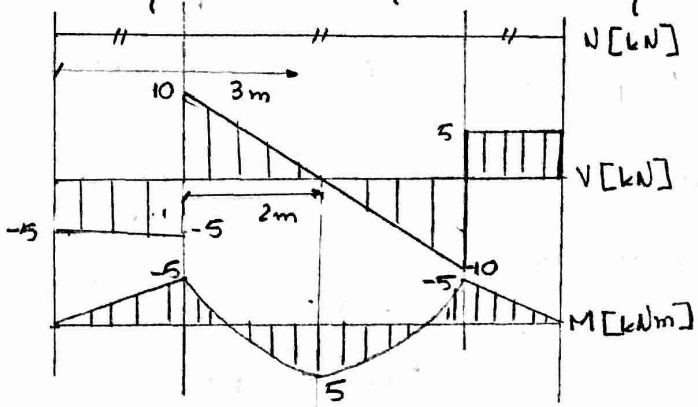
$-2{,}5 + 15 - 17{,}5$

trecho 3 : $(0 < \eta < 1m)$

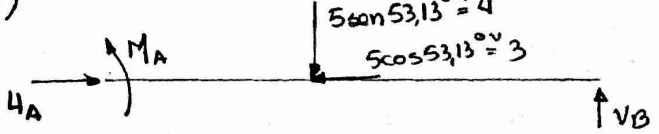


$N = 0$ $\quad V = 5$

$-M - 5\eta = 0 \Rightarrow M = -5\eta$



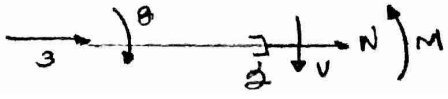
e)



$V_B = 4$ $\quad H_A = 3$

$\Sigma M = 0 : M_A + 2V_B = 0 \Rightarrow M_A = -8$

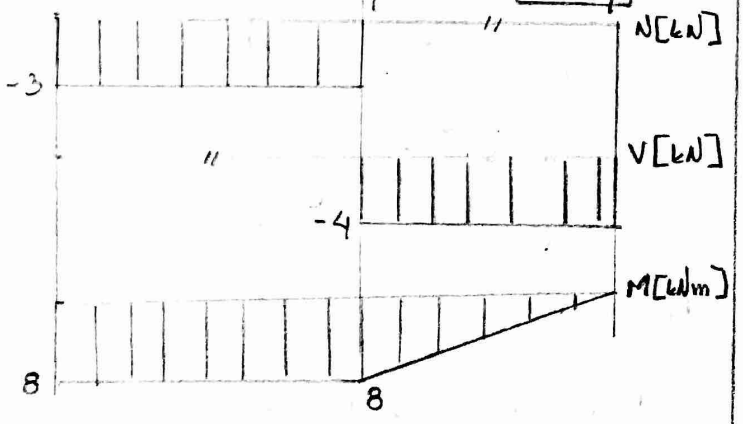
trecho 1 : $(0 < x < 2m)$



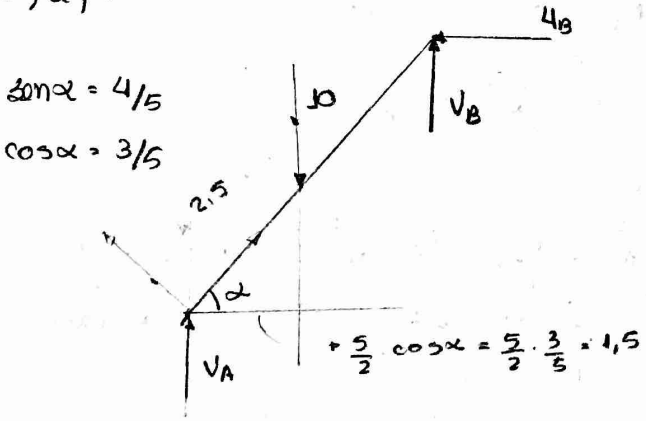
$N = -3$ $V = 0$ $11 - 8$

Trecho 2 $(0 < x < 2m)$

$V = -4$ $N = 0$ $-M + 4x = 0 \Rightarrow M = 4x$



3) a).



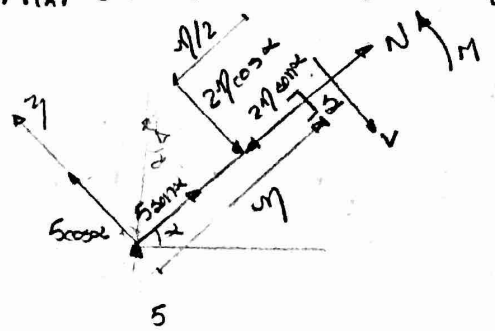
$\sin\alpha = 4/5$

$\cos\alpha = 3/5$

$H_B = 0$

$V_A + V_B = 10$

$\sum M_{(A)} = 0 : -2,5 \cdot 10 + 5V_B = 0 \Rightarrow V_B = 5 \quad V_A = 5$

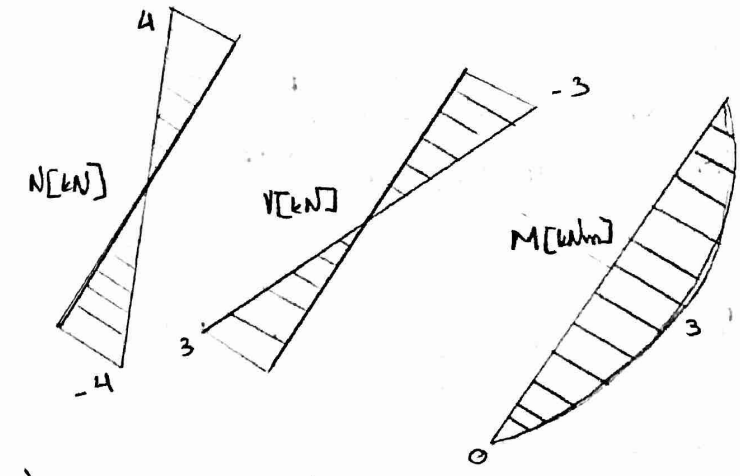


$-V + 5\cos\alpha - 2x\cos\alpha = 0 \Rightarrow V = 3 - 1,2x$

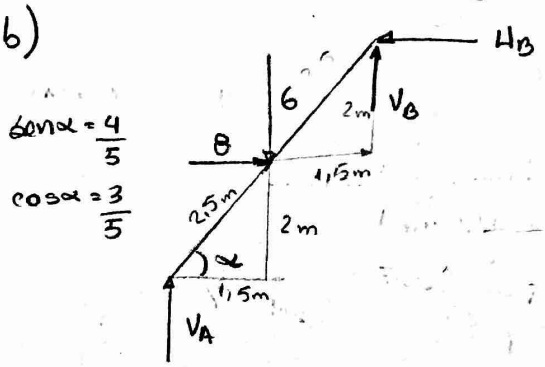
$N + 5\sin\alpha - 2x\sin\alpha = 0 \Rightarrow N = 1,6x - 4$

$M + x^2\cos\alpha - 5\cos\alpha \cdot x = 0 \Rightarrow$

$\Rightarrow M = -0,6x^2 + 3x$



6)



$\sin\alpha = \frac{4}{5}$

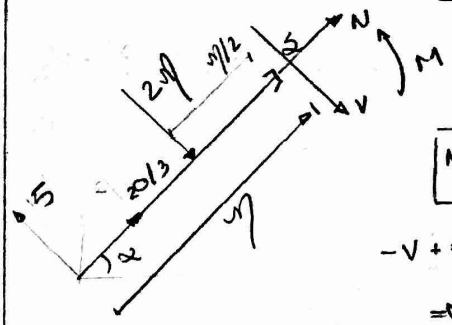
$\cos\alpha = \frac{3}{5}$

$H_B = 8$

$V_A + V_B = 6$

$\sum M = 0 : -16 - 9 + 3V_B + 32 = 0 \Rightarrow 3V_B = -7 \Rightarrow$

$\Rightarrow V_B = -\frac{7}{3} \quad V_A = \frac{25}{3}$

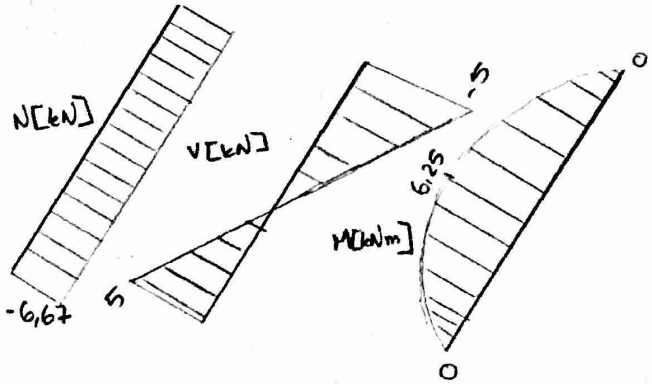


$N = -\frac{20}{3}$

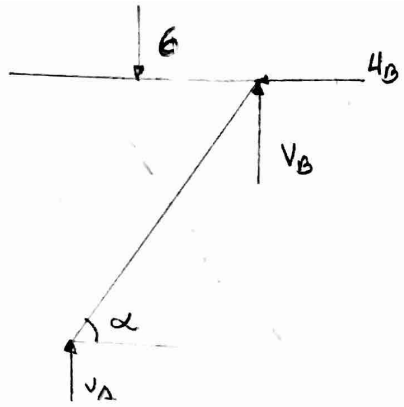
$-V + 5 - 2x = 0 \Rightarrow$

$\Rightarrow V = 5 - 2x$

$M - 5x + x^2 = 0 \Rightarrow M = -x^2 + 5x$



6)



$\sin\alpha = 4/5$

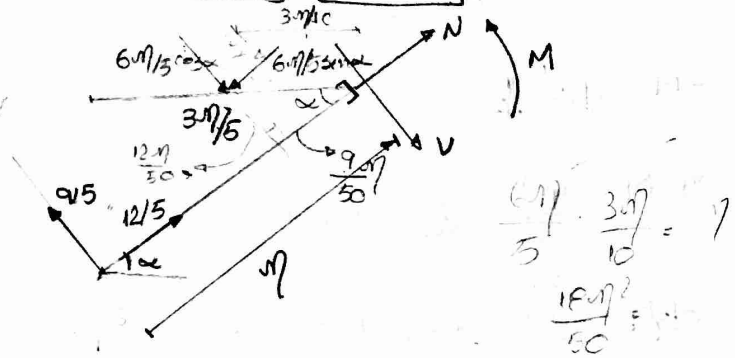
$\cos\alpha = 3/5$

$\boxed{M_B = 0}$

$V_A + V_B = 6$

$\Sigma M_{(B)} = 0 : -3V_A + 6 \cdot 1{,}5 = 0 \Rightarrow 3V_A = 6 \cdot 1{,}5 \Rightarrow$

$\Rightarrow \boxed{V_A = 3} \quad \boxed{V_B = 3}$



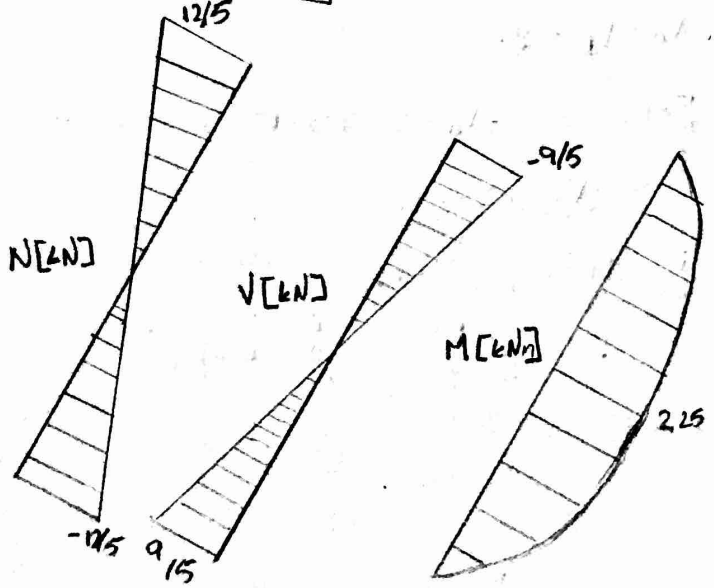
$N + \frac{12}{5} - \frac{24}{25}m = 0 \Rightarrow \boxed{N = \frac{24}{25}m - \frac{12}{5}}$

$-V + \frac{9}{5} - \frac{18}{25}m = 0 \Rightarrow \boxed{V = \frac{9}{5} - \frac{18}{25}m}$

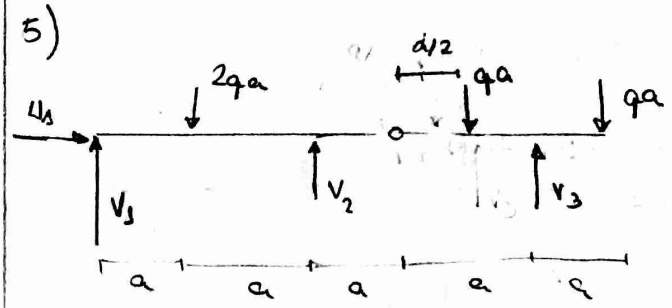
$M - \frac{9}{5}m + \frac{18}{25}m \cdot \frac{9}{50}m + \frac{24}{25}m \cdot \frac{12}{50}m = 0 \Rightarrow$

$\Rightarrow M = \frac{9}{5}m - \frac{162}{1250}m^2 - \frac{288}{1250}m^2 \Rightarrow$

$\Rightarrow \boxed{M = \frac{9}{5}m - \frac{9}{25}m^2}$



5)



$\boxed{H_1 = 0}$

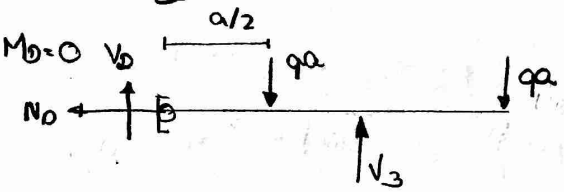
$V_1 + V_2 + V_3 = 4qa$

$\Sigma M_{(A)} = 0 : -2qa^2 + 2aV_2 - 3{,}5qa^2 + 4aV_3 - 5qa^2 = 0$

$\Rightarrow 2aV_2 + 4aV_3 = 10{,}5qa^2 \Rightarrow$

$\Rightarrow 2V_2 + 4V_3 = 10{,}5qa$

Corte em B



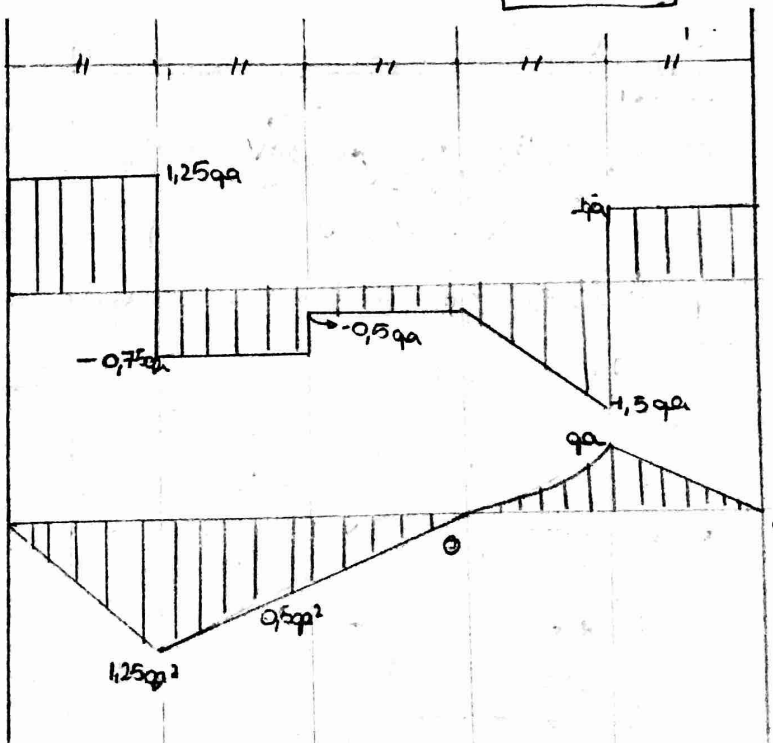
$-\frac{qa^2}{2} + aV_3 - 2qa^2 = 0 \Rightarrow$

$\Rightarrow -\frac{qa}{2} + V_3 - 2qa = 0 \Rightarrow \boxed{V_3 = \frac{5qa}{2}}$

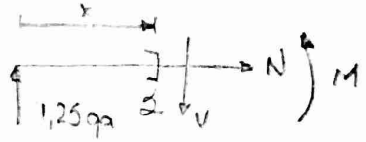
$2V_2 + 10qa - 10{,}5qa \Rightarrow 2V_2 = 0{,}5qa \Rightarrow$

$\Rightarrow \boxed{V_2 = 0{,}25qa}$

$V_1 + 0{,}25qa + 2{,}5qa = 4qa \Rightarrow \boxed{V_1 = 1{,}25qa}$



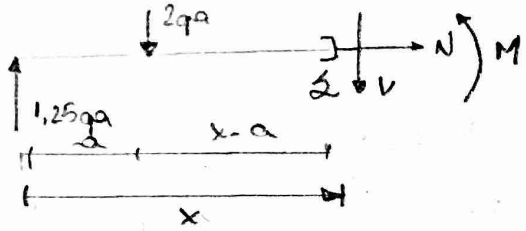
Trecho 1 ($0 < x < a$)



$V = V_1 \Rightarrow \boxed{V = 1{,}25qa}$

$\boxed{M = 1{,}25qax}$

Trecho 2 ($a < x < 2a$)



$\boxed{N = 0}$

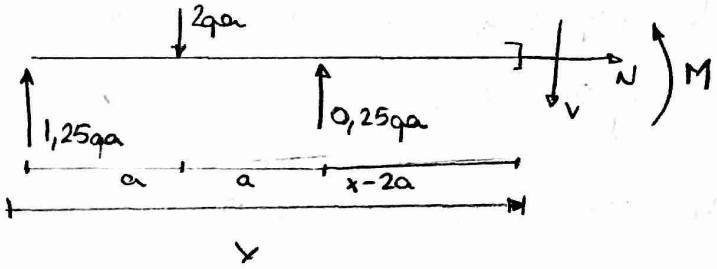
$V + 2qa = 1{,}25qa \Rightarrow \boxed{V = -0{,}75qa}$

$M - 1{,}25qax + 2qa(x-a) = 0 \Rightarrow$

$\Rightarrow M - 1{,}25qax + 2qax - 2qa^2 = 0 \Rightarrow$

$\Rightarrow M = 2qa^2 - 0{,}75qax$

Trecho 3 : ($2a < x < 3a$)



$\boxed{N = 0}$

$V + 2qa = 1{,}25qa + 0{,}25qa \Rightarrow \boxed{V = -0{,}5qa}$

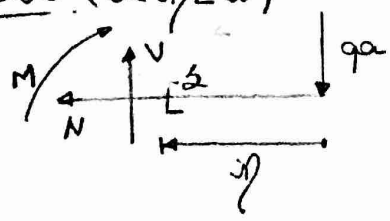
$M - 1{,}25qax + 2qa(x-a) - 0{,}25q(x-2a) = 0 \Rightarrow$

$\Rightarrow M - 1{,}25qx + 2qax - 2qa^2 - 0{,}25qx + 0{,}5q^2 = 0 \Rightarrow$

$\Rightarrow M - 0{,}5qax - 1{,}5qa^2 = 0 \Rightarrow$

$\Rightarrow \boxed{M = 0{,}5qax + 1{,}5qa^2}$

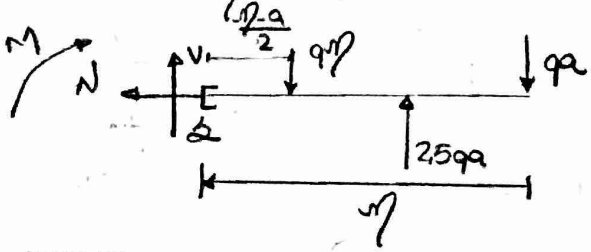
Trecho 5 : ($0 < y < a$)



$\boxed{V = qa}$ $\boxed{N = 0}$

$-M - qay = 0 \Rightarrow \boxed{M = -qay}$

Trecho 4 ($a < y < 2a$)



$\boxed{N = 0}$

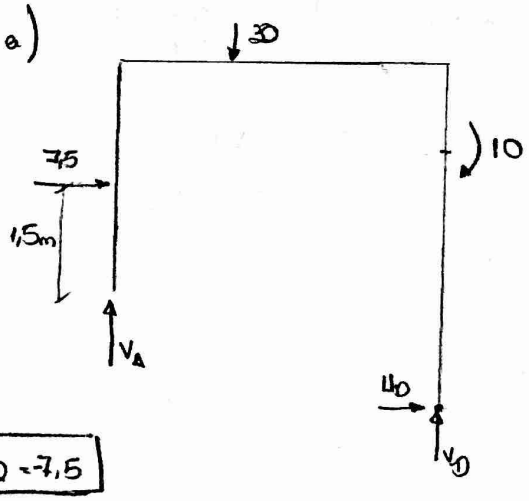
$V + 2{,}5qa = qa \Rightarrow \boxed{V = -1{,}5qa}$

$-M - qy\frac{(y-a)}{2} + 2{,}5qa(y-a) - qay = 0$

$\Rightarrow M = -\frac{qy^2}{2} + \frac{qya}{2} + 2{,}5qay - 2{,}5qa^2 - qay \Rightarrow$

$\Rightarrow \boxed{M = -\frac{qy^2}{2} + 2qay - 2{,}5qa^2}$

6) a)



$\boxed{H_D = 7{,}5}$

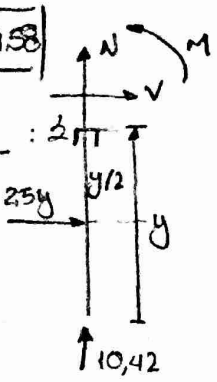
$V_A + V_D = 30$

$\sum M_{(D)} = 0 \quad -3V_A - 2{,}5 \cdot 7{,}5 - 10 + 60 = 0 \Rightarrow$

$\Rightarrow \boxed{V_A = 10{,}42}$

$\boxed{V_D = 19{,}58}$

Barra 1 : 2 T



$\boxed{N = -10{,}42}$

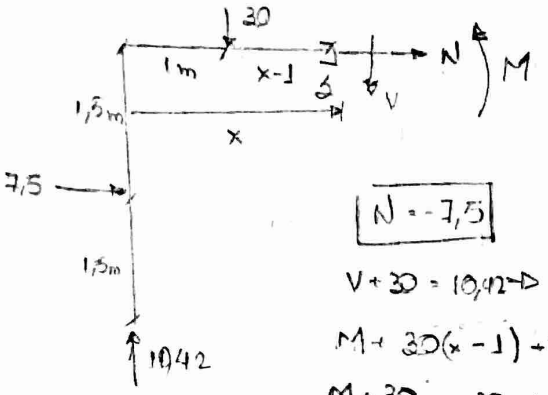
$\boxed{V = -2{,}5y}$

$M + 2{,}5x^2 = 0 \Rightarrow$

$\Rightarrow \boxed{M = -2{,}5y^2/2}$

Barra 2

trecho 2 ($1 < x < 3$)



$N = -7,5$

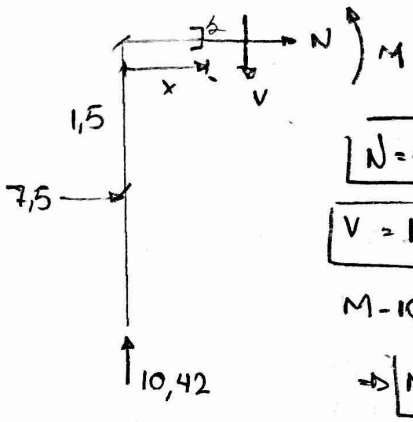
$V + 30 = 10,42 \Rightarrow V = -19,58$

$M + 30(x-1) + 7,5\,1,5 - 10,42x = 0$

$M + 30x - 30 + 11,25 - 10,42x = 0$

$M = -19,58x + 18,75$

trecho 1 : ($0 < x < 1$)



$N = -7,5$

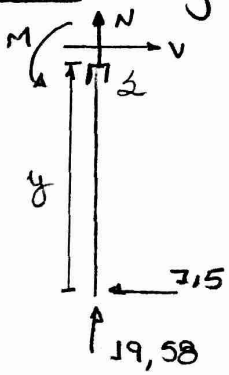
$V = 10,42$

$M - 10,42x + 11,25 = 0 \Rightarrow$

$\Rightarrow M = 10,42x + 11,25$

Barra 3:

trecho 1 : ($0 < y < 3m$)

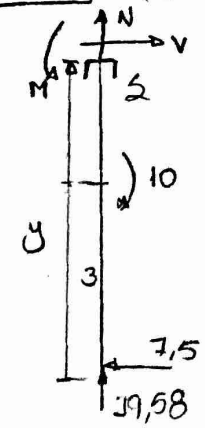


$N = -19,58$

$V = 7,5$

$M - 7,5y = 0 \Rightarrow M = 7,5y$

trecho 2 : ($3 < x < 4m$)

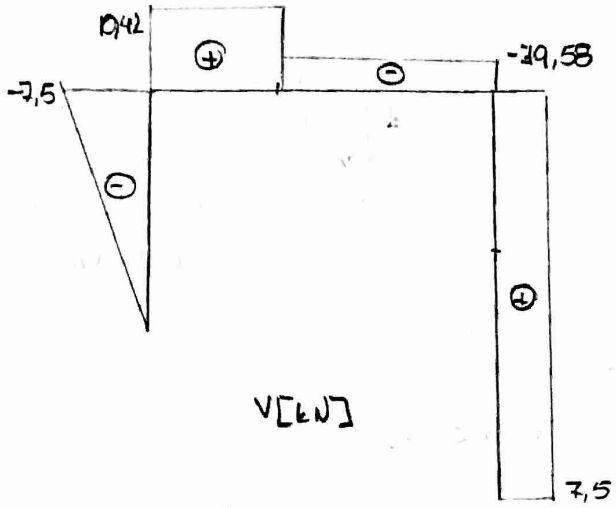


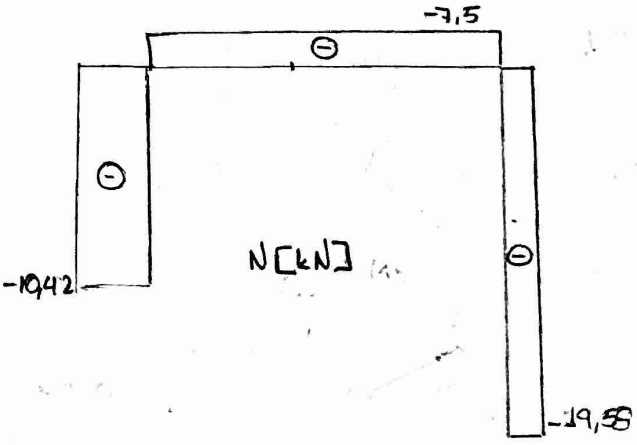
$N = -19,58$

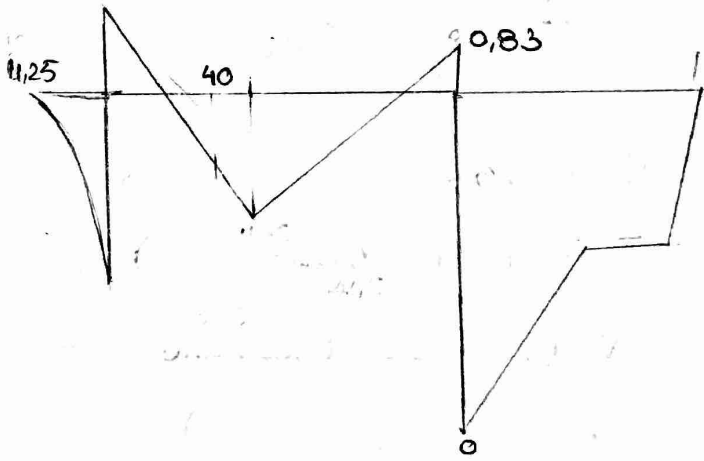
$V = 7,5$

$M - 10 - 7,5y = 0 \Rightarrow$

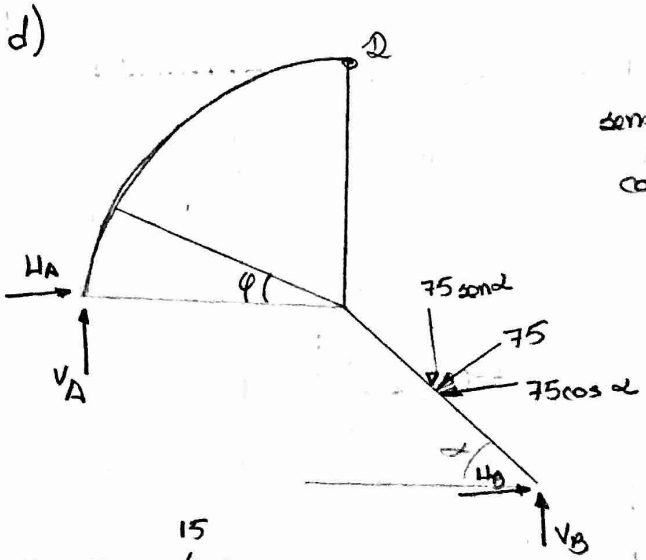
$\Rightarrow M = 10 + 7,5y$







d)

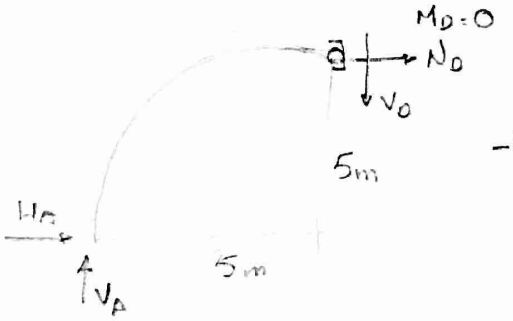


$\sin\alpha = \frac{3}{5}$

$\cos\alpha = 4/5$

$H_A + H_B - 75\,\frac{4}{5} = 0 \Rightarrow H_A + H_B = 60$

$V_A + V_B - 75\,\frac{3}{5} = 0 \Rightarrow V_A + V_B = 75$



$-H_A \cdot 5 - V_A \, 5 \Rightarrow$

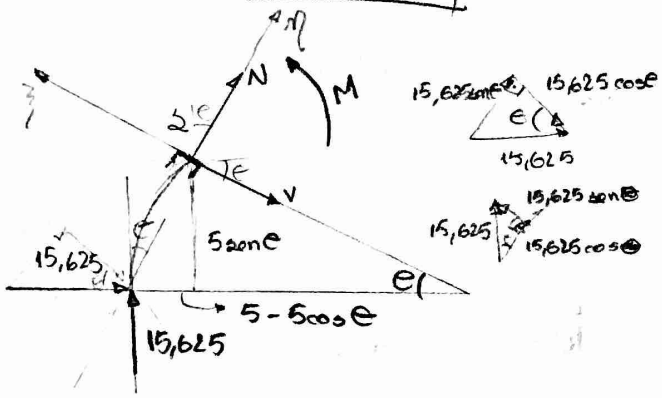
$\Rightarrow H_A = V_A$

$\Sigma M_{(B)} = 0 \cdot 75\,2{,}5 - 3H_A - 9V_A = 0 \Rightarrow$

$\Rightarrow H_A + 3V_A = 62{,}5$

$4V_A = 62{,}5 \Rightarrow \boxed{V_A = 15{,}625} \quad \boxed{H_A = 15{,}625}$

$\boxed{H_B = 44{,}375} \quad \boxed{V_B = 59{,}375}$



$N + 15{,}625 \operatorname{sen}\theta + 15{,}625 \cos\theta = 0 \Rightarrow$

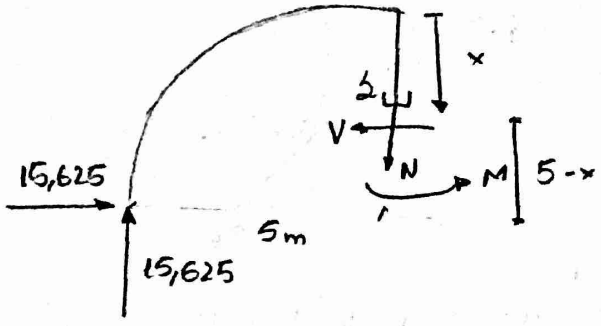
$\Rightarrow \boxed{N = -15{,}625(\operatorname{sen}\theta + \cos\theta) = 0}$

$-V - 15{,}625 \cos\theta + 15{,}625 \operatorname{sen}\theta = 0 \Rightarrow$

$\Rightarrow \boxed{V = 15{,}625(\operatorname{sen}\theta - \cos\theta)}$

$M + 15{,}625 \cdot 5 \operatorname{sen}\theta - 15{,}625 \cdot 5(1 - \cos\theta) = 0$

$\Rightarrow \boxed{M = 78{,}125(\operatorname{sen}\theta + \cos\theta - 1)}$



$\boxed{V = 15{,}625} \quad \boxed{N = 15{,}625}$

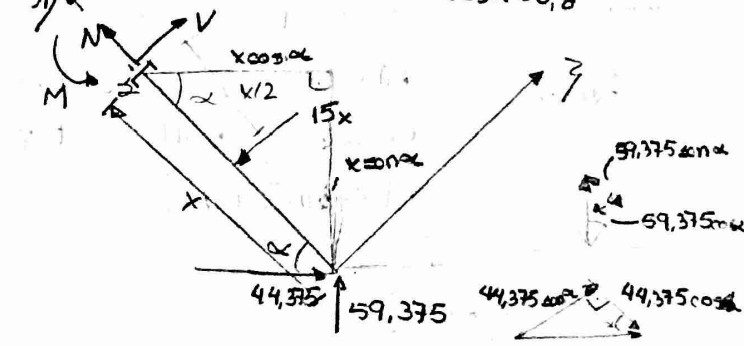
$M + 15{,}625(5 - x) - 15{,}625 \cdot 5 = 0 \Rightarrow$

$\Rightarrow M = -15{,}655\,5 + 15{,}625x + 15{,}625 \cdot 5 = 0 \Rightarrow$

$\Rightarrow \boxed{M = 15{,}625x}$

$\operatorname{sen}\alpha = 0{,}6$

$\cos\alpha = 0{,}8$



$V + 59{,}375 \cos\alpha + 44{,}375 \operatorname{sen}\alpha - 15x = 0 \Rightarrow$

$\Rightarrow \boxed{V = -74{,}125 + 15x}$

$N + 59{,}375 \operatorname{sen}\alpha - 44{,}375 \cos\alpha = 0 \Rightarrow$

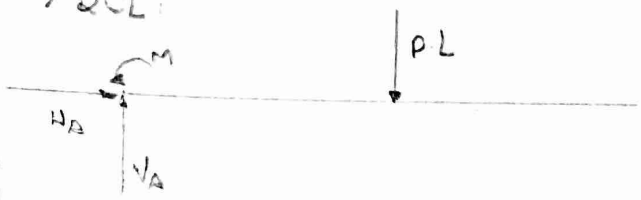
$\Rightarrow \boxed{N = -0{,}125}$

$M + 59{,}375x \cdot \cos\alpha + 44{,}375x \operatorname{sen}\alpha - \frac{15x^2}{2} = 0 \Rightarrow$

$\Rightarrow \boxed{M = \frac{15x^2}{2} + 74{,}125x}$

Lista 1 | Paulo Akira

1) DCL:

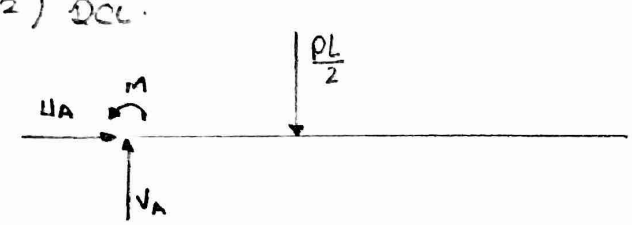


$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 : V_A - pL = 0 \Rightarrow V_A = pL$

$\Sigma M_A = 0 : M - pL\frac{L}{2} = 0 \Rightarrow M = \frac{pL^2}{2}$

2) DCL:

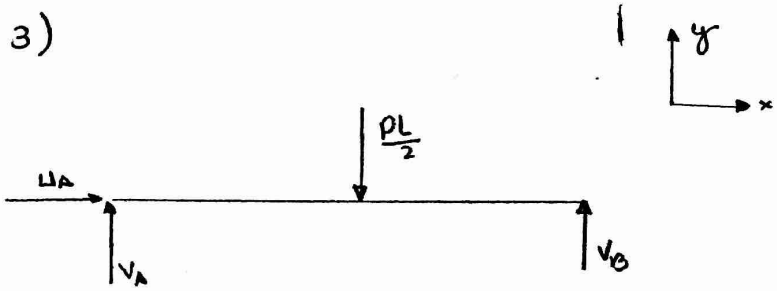


$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 : V_A - \frac{pL}{2} = 0 \Rightarrow V_A = \frac{pL}{2}$

$\Sigma M_A = 0 : M - \frac{pL}{2}\cdot\frac{L}{3} = 0 \Rightarrow M = \frac{pL^2}{6}$

3)



$\Sigma F_x = 0 : H_A = 0$

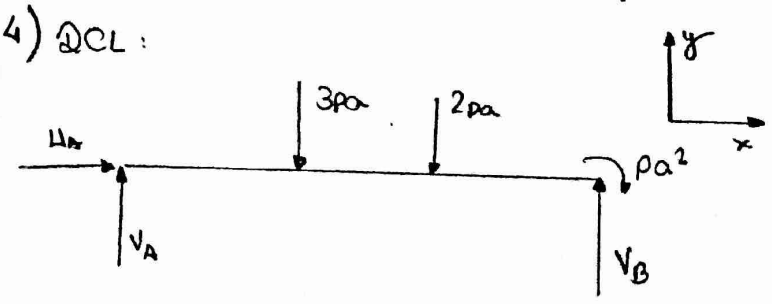
$\Sigma F_y = 0 : V_A + V_B - \frac{pL}{2} = 0 \Rightarrow V_A + V_B = \frac{pL}{2}$ (1)

$\Sigma M_A = 0 : -\frac{pL}{2}\cdot\frac{L}{2} + V_B \cdot L = 0 \Rightarrow$

$\Rightarrow V_B L = \frac{pL^2}{4} \Rightarrow V_B = \frac{pL}{4}$ (2)

De (1) em (2): $V_A + \frac{pL}{4} = \frac{pL}{2} \Rightarrow V_A = \frac{pL}{4}$

4) DCL:



$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 : V_A + V_B - 6pa = 0 \Rightarrow V_A + V_B = 5pa$ (1)

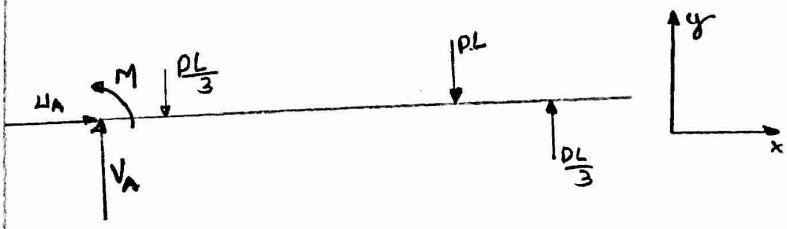
$\Sigma M_A = 0 : -3pa\,\frac{5a}{2} - 2pa\cdot 4a + V_B \cdot 6a - pa^2 = 0 \Rightarrow$

$\Rightarrow -\frac{15pa^2}{2} - 8pa^2 - pa^2 + 6V_B a = 0 \Rightarrow$

$\Rightarrow 6V_B a = \frac{33pa^2}{2} \Rightarrow V_B = \frac{33pa}{12}$ (2)

De (2) em (1): $V_A = 5pa - \frac{33pa}{12} = \frac{27pa}{12}$

5) DCL:



$\Sigma F_x = 0 : H_A = 0$

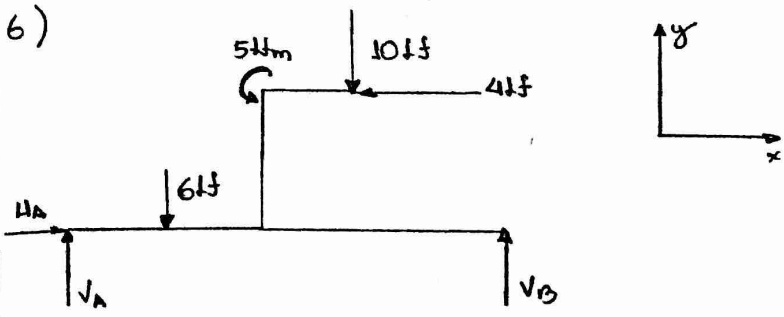
$\Sigma F_y = 0 : V_A + \frac{pL}{3} - \frac{pL}{3} - pL = 0 \Rightarrow V_A = pL$

$\Sigma M_A = 0 : M - \frac{pL}{3}\cdot\frac{L}{6} + \frac{pL}{3}\cdot\frac{5L}{6} - pL\cdot\frac{2L}{3} = 0 \Rightarrow$

$\Rightarrow M - \frac{pL^2}{18} + \frac{5pL^2}{18} - \frac{12pL^2}{18} = 0 \Rightarrow$

$\Rightarrow M + \frac{4pL^2}{18} - \frac{12pL^2}{18} = 0 \Rightarrow M = \frac{8pL^2}{18} \Rightarrow M = \frac{4pL^2}{9}$

6)



$\Sigma F_x = 0 : H_A = 4tf$

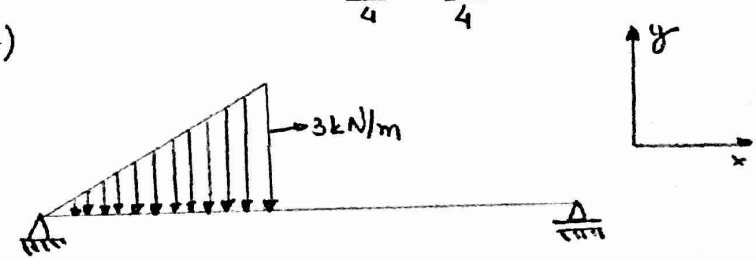
$\Sigma F_y = 0 : V_A - 6 + V_B - 10 = 0 \Rightarrow V_A + V_B = 16$ (1)

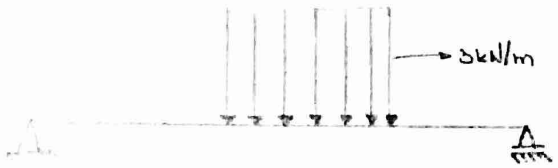
$\Sigma M_A = 0 : +5 - 6\cdot 1 + 4\cdot 2 - 10\cdot 3 + V_B \cdot 4 = 0 \Rightarrow$

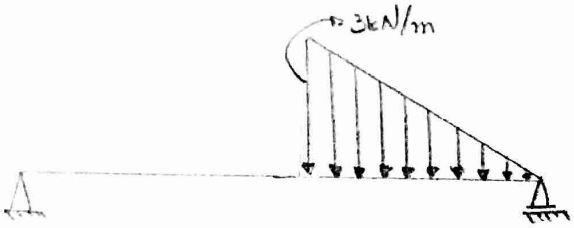
$\Rightarrow 5 - 6 + 8 - 30 + 4V_B = 0 \Rightarrow V_B = \frac{23}{4}\,tf$ (2)

De (2) em (1): $V_A + 16 - \frac{23}{4} = \frac{41}{4}\,tf$

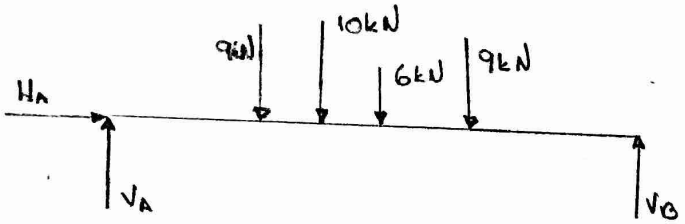
7)







DCL:



$\Sigma F_x = 0 : H_A = 0$

$\Sigma F_y = 0 : V_A + V_B - 9 - 10 - 6 - 9 = 0 \Rightarrow$

$\Rightarrow V_A + V_B = 34 \quad (1)$

$\Sigma M_A = 0 : -9 \cdot 4 - 10 \cdot 6 - 6 \cdot 7 - 9 \cdot 10 + V_B \cdot 14 = 0 \Rightarrow$

$\Rightarrow -36 - 60 - 42 - 90 + 14 V_B = 0 \Rightarrow$

$\Rightarrow V_B = \frac{228}{14} = \frac{114}{7} \quad (2)$

De (2) em (1) : $V_A = 34 - \frac{114}{7} = \frac{124}{7}$