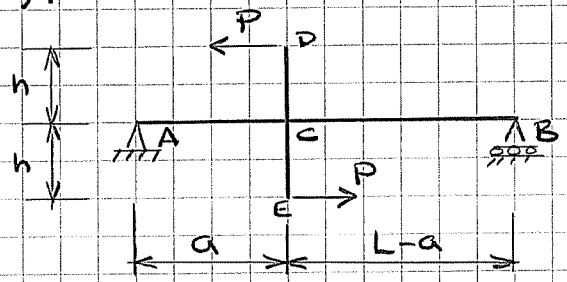
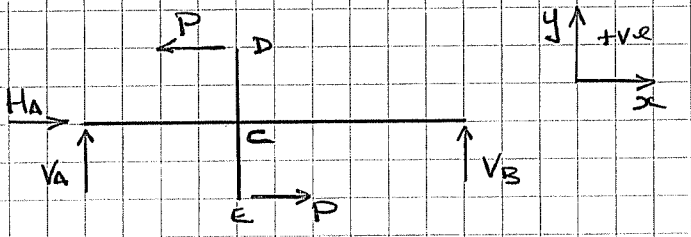
STRUCTURES II ANALYSIS

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

1).





FBD

REQUIRED : SFD & BMD

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $V_A = -V_B$ $\quad [\overrightarrow{\Sigma F} = 0]$: $\boxed{H_A = 0}$

$[\Sigma \overset{\curvearrowright}{M_A} = 0]$: $-Ph - Ph - V_B \cdot L = 0$ $\quad \therefore \boxed{V_B = -\frac{2Ph}{L} = -V_A}$

TO FIND BMD

$\overset{\curvearrowleft}{M_{C_{A-C}}}$: $M_C - \frac{2Ph}{L} \cdot a = 0$ $\quad \therefore \boxed{M_C = +\frac{2Pha}{L}}$

$\overset{\curvearrowright}{M_{C_{C-B}}}$: $M_C + \frac{2Ph}{L} \cdot (L-a) = 0$ $\quad \therefore \boxed{M_C = -\frac{2Ph}{L}(L-a)}$

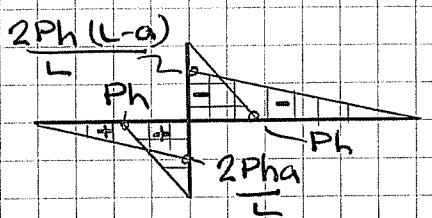
$\overset{\curvearrowleft}{M_{C_{C-D}}}$: $M_C + Ph = 0$ $\quad \therefore \boxed{M_C = -Ph}$

TO FIND SFD

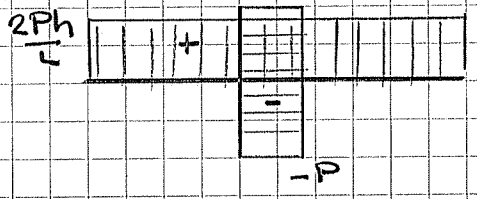
SF A-B : $\underline{@A = \frac{2Pha}{L}}$, $\underline{@B = \frac{2Ph}{L}}$

SF D-E : $\underline{@D = -P}$, $\underline{@E = -P}$

SUMMARY



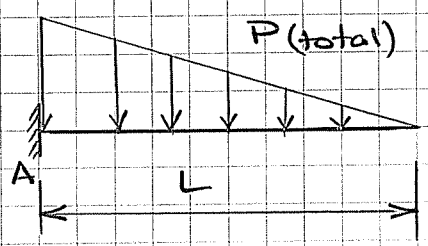
BMD

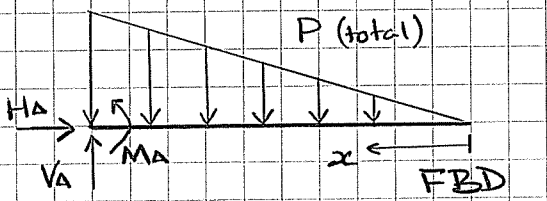


SFD

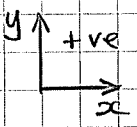
REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

2).





FBD



REQUIRED : SFD & BMD

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $\boxed{V_A = P}$, $[\overrightarrow{\Sigma F} = 0]$: $\boxed{H_A = 0}$

$[\Sigma \overrightarrow{M_A} = 0]$: $-M_A + \frac{PL}{3} = 0$ $\therefore$ $\boxed{M_A = +\frac{PL}{3}}$

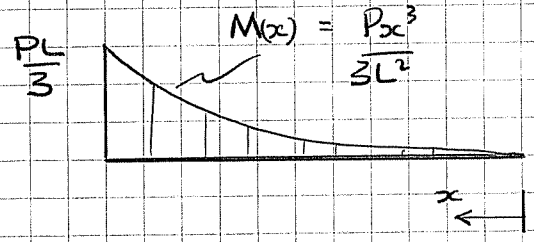
FUNCTION M(x)

$$\boxed{M(x) = \frac{P x^3}{3L^2}}$$

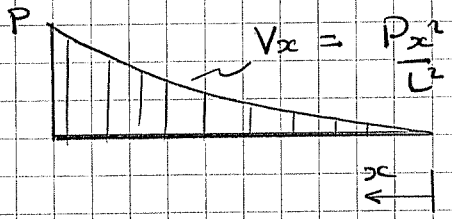
FUNCTION V(x)

$$\boxed{V(x) = \frac{P x^2}{L^2}}$$

SUMMARY



BMD

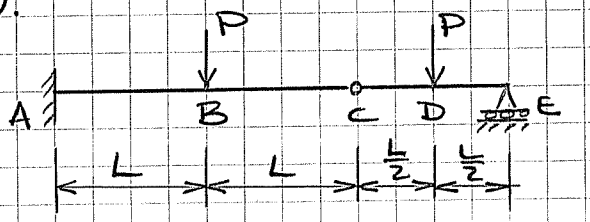


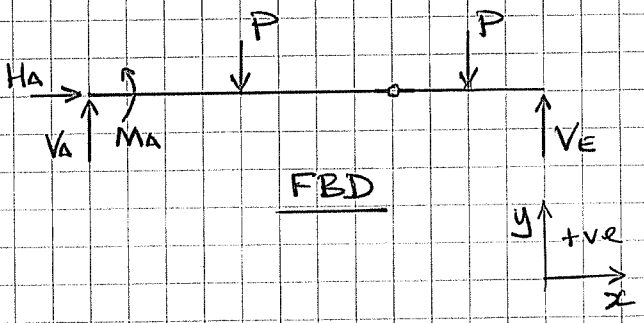
SFD

STRUCTURES II ANALYSIS

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

3).





FBD

REQUIRED : SHD & BMD

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $V_A + V_E = 2P$, $[\overrightarrow{\Sigma F} = 0]$: $\boxed{H_A = 0}$

$[\overset{\curvearrowright}{M_{C_r}} = 0]$: $\frac{PL}{2} - LV_E = 0$ $\therefore$ $\boxed{V_E = \frac{P}{2}}$

HENCE : $\boxed{V_A = \frac{3P}{2}}$

TO FIND BMD

$\overset{\curvearrowright}{M_{A_r}}$: $-M_A + PL + \frac{5PL}{2} - \frac{3PL}{2} = 0$ $\therefore$ $\boxed{M_A = 2PL}$

$\overset{\curvearrowright}{M_{B_r}}$: $M_B + \frac{3PL}{2} - \frac{2PL}{2} = 0$ $\therefore$ $\boxed{M_B = -\frac{PL}{2}}$

$\overset{\curvearrowright}{M_{D_r}}$: $M_D - \frac{PL}{4} = 0$ $\therefore$ $\boxed{M_C = \frac{PL}{4}}$

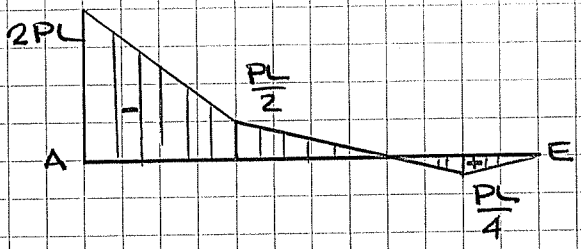
TO FIND SFD

SF A-B : @A = $\frac{3P}{2}$, @B = $\frac{3P}{2}$

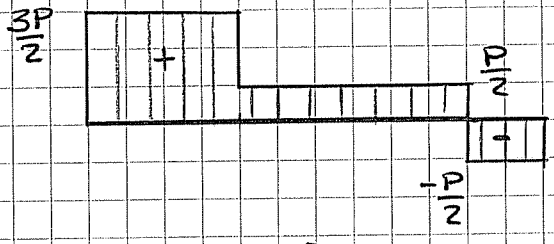
SF B-D : @B = $\frac{P}{2}$, @D = $\frac{P}{2}$

SF D-E : @D = $-\frac{P}{2}$, @E = $-\frac{P}{2}$

SUMMARY



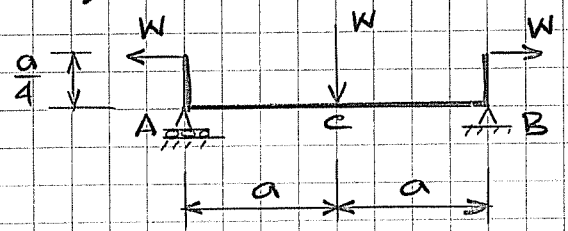
BMD

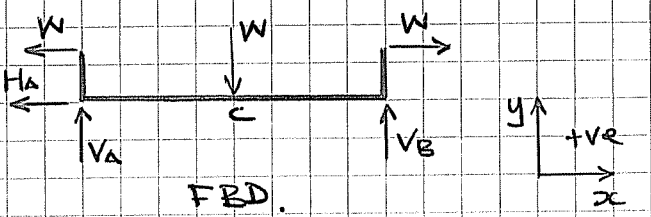


SFD

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

5).





FBD.

REQUIRED : SFD & BMD.

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $V_A + V_B = W$, $[\overrightarrow{\Sigma F} = 0]$: $\boxed{H_B = 0}$

$[\curvearrowright \Sigma M_A = 0]$: $-W\frac{a}{4} + W\frac{a}{4} + Wa - 2V_B a = 0$ $\therefore$ $\boxed{V_B = \frac{W}{2}}$

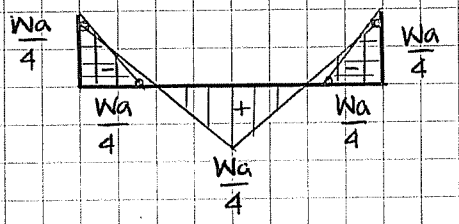
HENCE : $\boxed{V_A = \frac{W}{2}}$

TO FIND B.M.D.

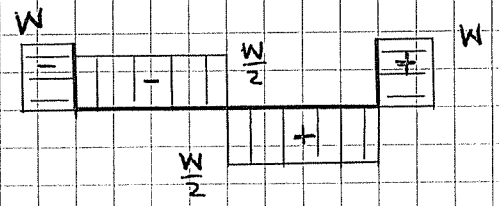
$\curvearrowright M_C = 0$: $M_C + W\frac{a}{4} - W\frac{a}{2} = 0$ $\therefore$ $\boxed{M_C = \frac{Wa}{4}}$

$\curvearrowright M_A = 0$: $M_A + W\frac{a}{4} + Wa - 2a\frac{W}{2} = 0$ $\therefore$ $\boxed{M_A = -\frac{Wa}{4}}$

SUMMARY



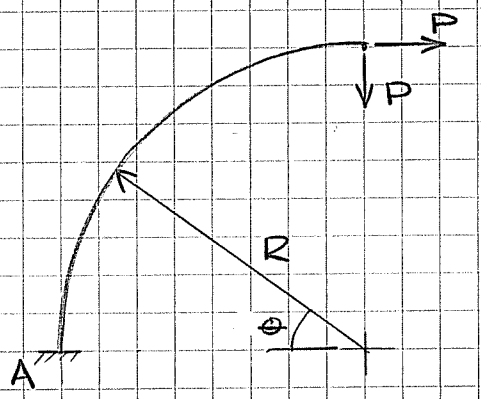
BMD

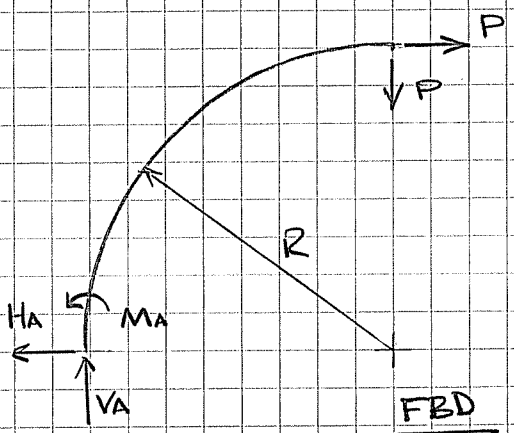


SFD

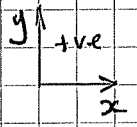
REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

6).





FBD



REQUIRED : SFD & BMD.

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $\boxed{V_A = P}$

$[\overrightarrow{\Sigma F} = 0]$: $\boxed{H_A = P}$

$[\Sigma \overset{\curvearrowright}{M_A} = 0]$: $-M_A + PR + PR = 0$ $\therefore \boxed{M_A = 2PR.}$

FUNCTION $M(\theta)$

$M(\theta) = +PR\sin\theta - PR - PR\cos\theta$

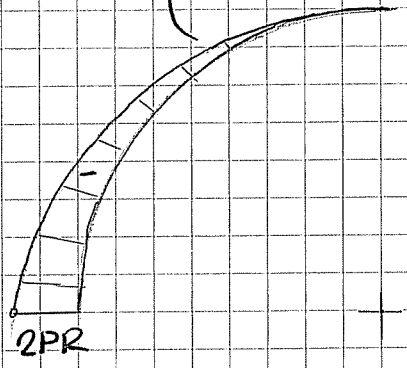
$= \boxed{-PR[\cos\theta + 1 - \sin\theta]}$

FUNCTION $V(\theta)$

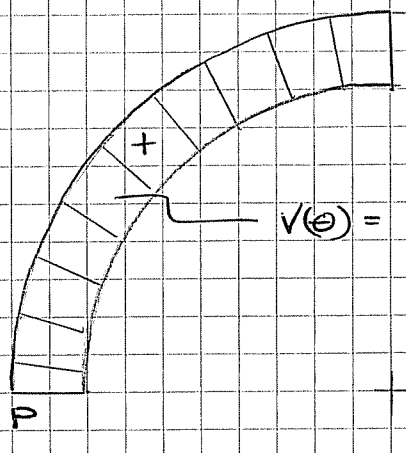
$V(\theta) = \boxed{P\sin\theta + P\cos\theta}$

SUMMARY

$M(\theta) = -PR[\cos\theta + 1 - \sin\theta]$



BMD

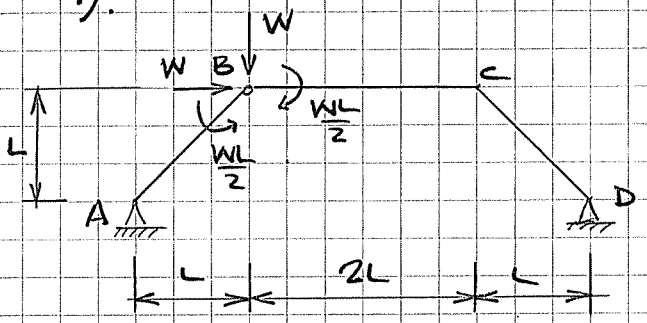


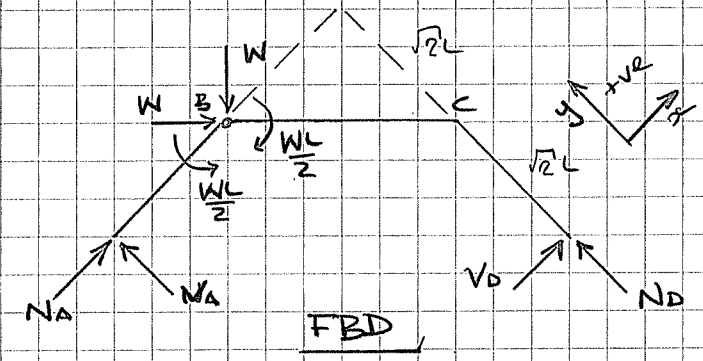
SFD

STRUCTURES II ANALYSIS

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

7).





FBD

REQUIRED : SFD & BMD

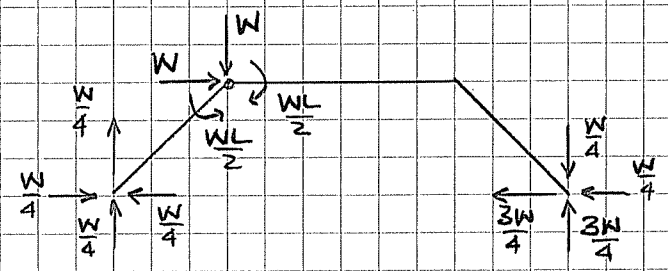
FOR EQUILIBRIUM

$\left[\sum M_B = 0\right]$: $-\frac{WL}{2} + V_A \sqrt{2}L = 0$ $\therefore$ $\boxed{V_A = \frac{W}{2\sqrt{2}}}$

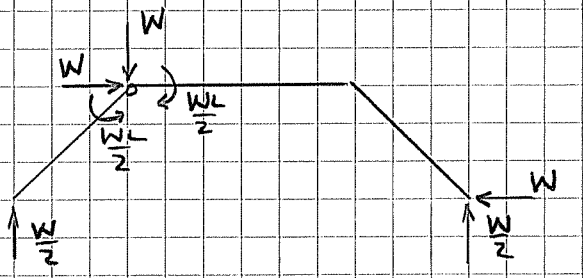
$\left[\sum V = 0\right]$: $\frac{W}{2\sqrt{2}} - \frac{2W}{\sqrt{2}} + N_D = 0$ $\therefore$ $\boxed{N_D = \frac{3W}{2\sqrt{2}}}$

$\left[\sum M_C = 0\right]$: $\frac{WL}{2} - V_D \cdot 2\sqrt{2}L - \frac{3W}{2\sqrt{2}} \cdot \sqrt{2}L = 0$ $\therefore$ $\boxed{V_D = -\frac{W}{2\sqrt{2}}}$

$\left[\sum N = 0\right]$: $N_A - \frac{W}{2\sqrt{2}} = 0$ $\therefore$ $\boxed{N_A = \frac{W}{2\sqrt{2}}}$

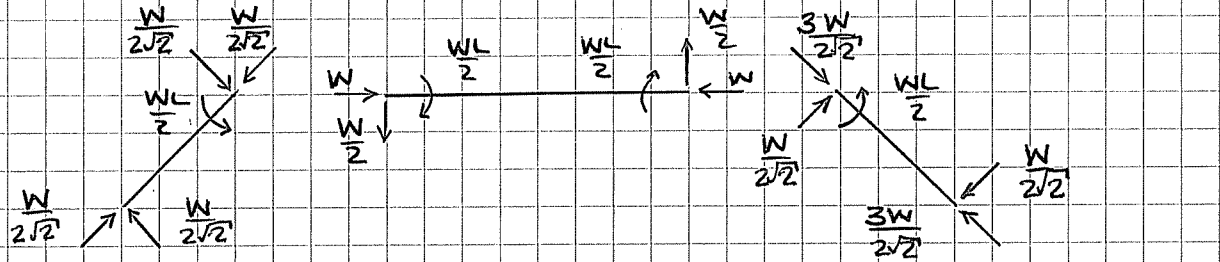


OR.

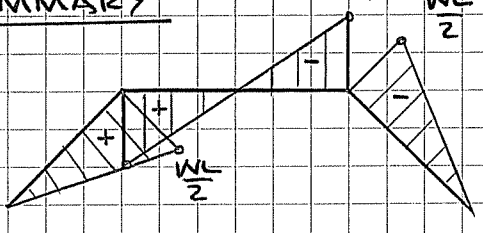


TO FIND BMD.

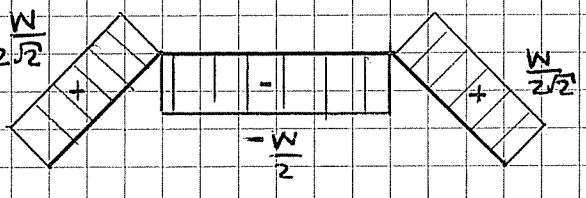
$\left[\sum M_C\right]$: $\frac{W}{2\sqrt{2}} \cdot \sqrt{2}L + M_C = 0$ $\therefore$ $\boxed{M_C = -\frac{WL}{2}}$



SUMMARY



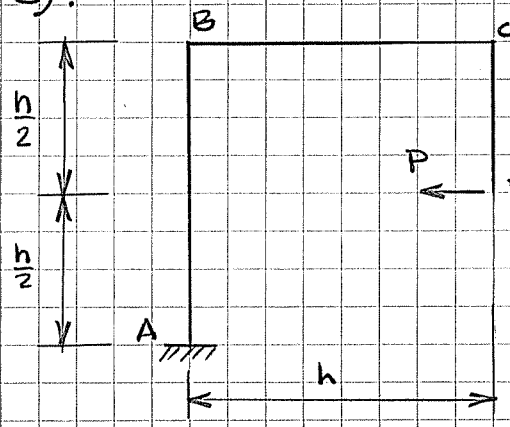
BMD

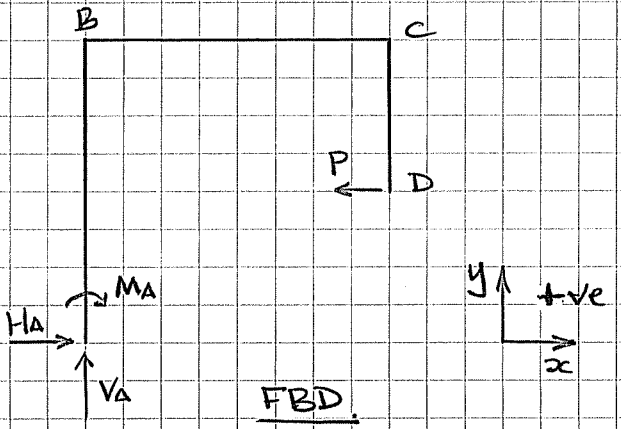


SFD

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

8).





FBD.

REQUIRED : SFD & BMD.

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $\boxed{V_A = 0}$ $\quad [\vec{\Sigma F} = 0]$: $\boxed{H_A = P}$

$[\curvearrowright \Sigma \vec{M_A} = 0]$: $M_A - \frac{Ph}{2} = 0$ $\quad \therefore$ $\boxed{M_A = \frac{Ph}{2}}$

TO FIND BMD

$\curvearrowright \vec{M}_{B_r}$: $M_B + \frac{Ph}{2} = 0$ $\quad \therefore$ $\boxed{M_B = -\frac{Ph}{2}}$

$\curvearrowright \vec{M}_{C_r}$: $M_C + \frac{Ph}{2} = 0$ $\quad \therefore$ $\boxed{M_C = -\frac{Ph}{2}}$

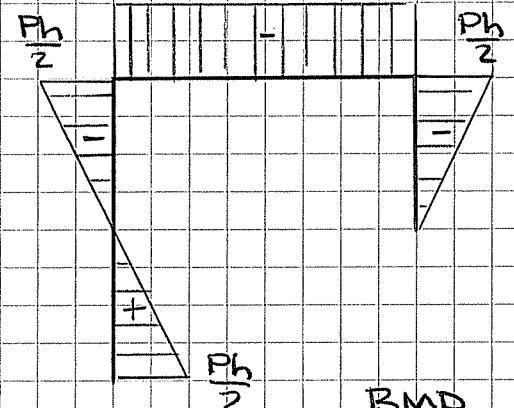
TO FIND SFD

SF A-B : @ A = $-P$; @ B = $-P$

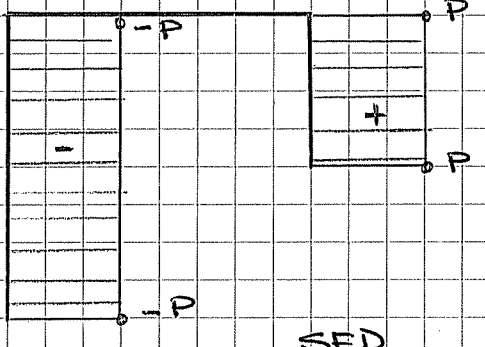
SF B-C : @ B = 0 ; @ C = 0

SF C-D : @ C = $+P$; @ D = $+P$

SUMMARY



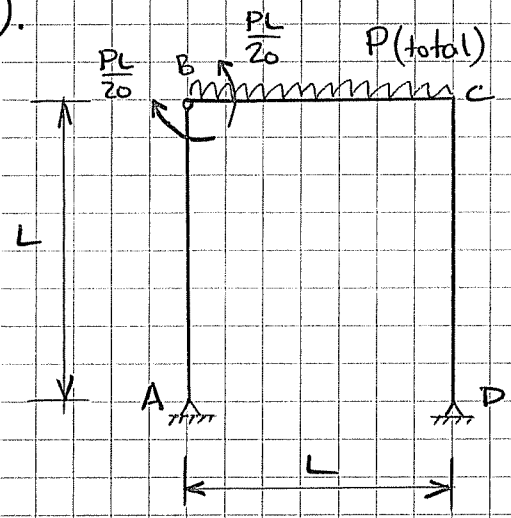
BMD

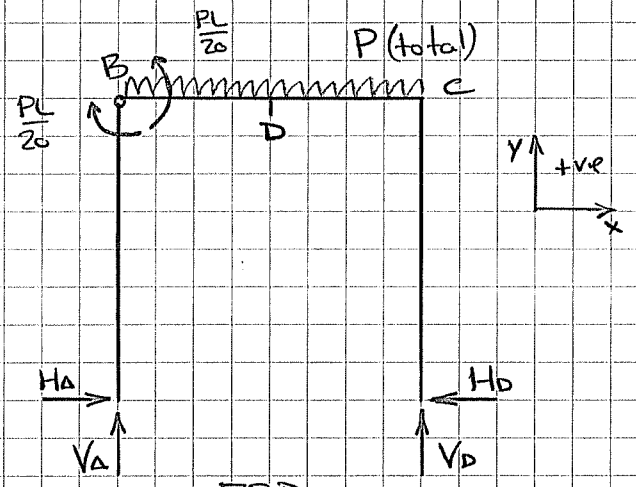


SFD

REVISION OF SHEAR FORCE AND BENDING MOMENT DIAGRAMS

9).





FBD

REQUIRED: SFD & BMD

FOR EQUILIBRIUM

$[\uparrow \Sigma F = 0]$: $V_A + V_D = P$

$[\overrightarrow{\Sigma F} = 0]$: $H_A = H_D$

$[\overrightarrow{M_B} = 0]$: $-H_A L + \frac{PL}{20} = 0$

$\therefore$ $H_A = \frac{P}{20}$

HENCE : $H_D = \frac{P}{20}$

$\overrightarrow{M_{B_r}} = 0$: $-\frac{PL}{20} + \frac{PL}{2} + \frac{PL}{20} - V_D \cdot L = 0$

$\therefore$ $V_D = \frac{P}{2}$

HENCE : $V_A = \frac{P}{2}$

TO FIND BMD

$\overrightarrow{M_{C_r}}$: $\frac{PL}{20} \cdot 4 - M_C = 0$

$\therefore$ $M_C = -\frac{PL}{20}$

M_{AX} : $\frac{PL}{8} - \frac{PL}{20} = \frac{5PL}{40} - \frac{2PL}{40}$

$\therefore$ $M_{AX} = \frac{3PL}{40}$