

Solution examen RDM II - 3^{ème} année G1

Ex 01 :

- 1 : Calculer Les Réactions :

$$\sum M_A = 0 \Rightarrow R_{By} (9) - 30 (9) \left(\frac{9}{2}\right) - P (12) = 0 \Rightarrow \boxed{R_{By} = \frac{4P}{3} + 135}$$

$$\sum F_v = 0 \Rightarrow R_{By} + R_{Ay} - 30 (9) - P = 0 \Rightarrow R_{Ay} + \frac{4P}{3} + 135 - 270 - P = 0$$

$$\boxed{R_{Ay} = -\frac{P}{3} + 135}$$

- 2 : Calculer Les Moments :

• AB : $0 \leq x \leq 9 \Rightarrow \sum M_{AB} = 0$ (+)

$$-R_{Ay}(x) + 30(x) \left(\frac{x}{2}\right) + M_{AB} = 0$$

$$M_{AB} = R_{Ay} \cdot x - 15x^2 = \left(-\frac{P}{3} + 135\right)x - 15x^2$$

• BC : $0 \leq x \leq 3 \Rightarrow \sum M_{BC} = 0$ (+)

$$-M_{BC} - Px = 0 \Rightarrow M_{BC} = -Px$$

$$\frac{\partial M_{AB}}{\partial P} = -\frac{x}{3} \quad \left| \quad \frac{\partial M_{BC}}{\partial P} = -x \right.$$

$$\delta_{AB} \Big|_{P=55} = \frac{1}{EI} \int_0^9 M_{AB} \cdot \frac{\partial M_{AB}}{\partial P} dx = \frac{1}{EI} \int_0^9 \left[\left(-\frac{P}{3} + 135\right)x - 15x^2 \right] \cdot \left(-\frac{x}{3}\right) dx = \frac{-1298,75}{EI} \text{ KN.m}^3$$

$$\delta_{BC} \Big|_{P=55} = \frac{1}{EI} \int_0^3 (-x)(-Px) dx = \frac{1}{EI} \int_0^3 -x(-55x) dx = \frac{495}{EI} \text{ KN.m}^3$$

$$\Delta_{\text{tot}} = \frac{\delta U_1}{\delta P} + \frac{\delta U_2}{\delta P} = -\frac{753,75}{EI} = -4,54 \times 10^{-3} \text{ m} = -4,54 \text{ mm}$$

Exercice 02 :

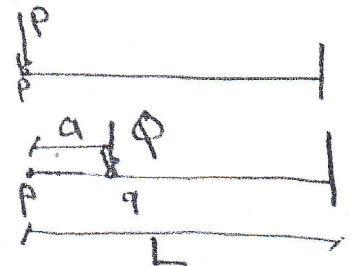
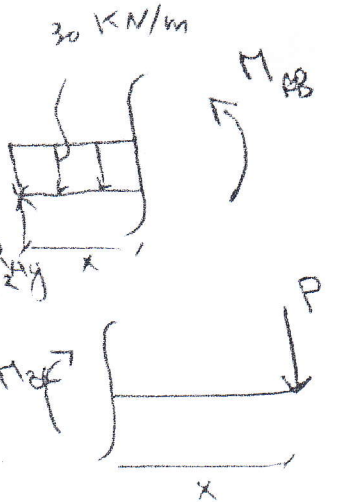
- on connaît $(\delta_p)_P$ et $(\delta_q)_P$; on cherche $(\delta_p)_Q$?

$$P(\delta_p)_Q = Q(\delta_q)_P \Rightarrow (\delta_p)_Q = \frac{Q}{P} (\delta_q)_P$$

$$A = x = a \Rightarrow v_x = (\delta_q)_P$$

$$\text{donc : } (\delta_p)_Q = \frac{Q}{P} \left[\frac{-P}{6EI} (2L^3 - 3L^2 \cdot a + a^3) \right]$$

$$\boxed{(\delta_p)_Q = -\frac{Q}{6EI} (2L^3 - 3L^2 \cdot a + a^3)}$$



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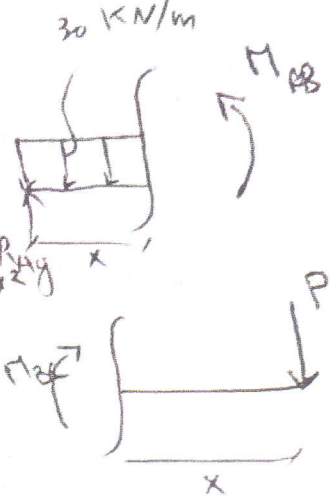
$$\frac{\delta M_{AB}}{\delta P} = -\frac{x}{3}$$

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