



Corrige : RDM2

licence : Construction Mécanique – Session Normale

M'sila le : .....

Ex N° 1 :

$$R_A = 933 \text{ N}, R_B = 317 \text{ N}$$

$$P(x) = R_A \langle x \rangle^{-1} + M \langle x-2 \rangle^{-2} - 9 \langle x-5 \rangle^0 + R_B \langle x-10 \rangle^{-1}$$

$$T(x) = R_A \langle x \rangle^0 + M \langle x-2 \rangle^{-1} - 9 \langle x-5 \rangle^1 + R_B \langle x-10 \rangle^0$$

$$M(x) = R_A \langle x \rangle^1 + M \langle x-2 \rangle^0 - \frac{9}{2} \langle x-5 \rangle^2 + R_B \langle x-10 \rangle^1$$

$$EI y''(x) = M(x)$$

$$EI y'(x) = \frac{R_A}{2} \langle x \rangle^2 + M \langle x-2 \rangle^1 - \frac{9}{6} \langle x-5 \rangle^3 + Cx + D$$

$$EI y(x) = \frac{R_A}{6} \langle x \rangle^3 + \frac{M}{2} \langle x-2 \rangle^2 - \frac{9}{24} \langle x-5 \rangle^4 + Cx^2 + Dx$$

$$x=0, y=0 \Rightarrow D=0$$

$$x=l, y=0 \Rightarrow C = \frac{1}{6} \left( -R_A \langle l \rangle^3 - \frac{M}{2} \langle l-2 \rangle^2 - \frac{9}{24} \langle l-5 \rangle^4 \right)$$

$$\text{Donc : } y'(x) = \frac{1}{EI} \left( \frac{R_A}{2} \langle x \rangle^2 + M \langle x-2 \rangle^1 - \frac{9}{6} \langle x-5 \rangle^3 + \left( \frac{1}{6} R_A l^3 - \frac{M}{2} \langle l-2 \rangle^2 - \frac{9}{24} \langle l-5 \rangle^4 \right) x \right)$$

$$y(x) = \frac{1}{EI} \left( \frac{R_A}{6} \langle x \rangle^3 + \frac{M}{2} \langle x-2 \rangle^2 - \frac{9}{24} \langle x-5 \rangle^4 + \left( -\frac{1}{6} R_A l^3 - \frac{M}{2} \langle l-2 \rangle^2 - \frac{9}{24} \langle l-5 \rangle^4 \right) x \right)$$

Ex N° 2

$$R_A = R_B = \frac{ql}{2}, \quad q = 300 \text{ N/m}$$

$$M_f = R_A x - \frac{q x^2}{2}$$

$$W = \frac{1}{2EI} \int_0^l M_f^2 dx = \frac{q^2 l^5}{240EI}$$

$$E = 10500 \text{ MPa}$$

$$I = \frac{125 \times (200)^3}{12} = 833333 \text{ m}^4$$

$$W = 8,098 \times 10^{-3} \text{ Joule (N.m)}$$

2) Poutre de section circulaire de  $d = 100 \text{ mm} \Rightarrow I = \frac{\pi d^4}{64} = \frac{3,14 \times 100^4}{64} = 4906250 \text{ mm}^4 = 490,625 \text{ m}^4$

$$W = 0,137 \text{ Joule}$$

Ex N° 3 :

Energie de déformation pour :

\* la Torsion :  $W = \frac{1}{2GJ} \int_0^l M_t^2 dx$

\* le cisaillement :  $W = \frac{1}{2G} \int_0^l T_g^2 dx$