Apéndice auxiliar N°1 2014

ME3202

A.1 | Cálculo de Fzas equivalentes y posiciones $\boxed{P2}$

$$\rightsquigarrow F_1 = \int_0^L \omega_0 dx = \omega_0 L$$

$$\rightsquigarrow x_1 = \frac{\int_0^L x \omega_0 dx}{\omega_0 L} = \frac{\omega_0 \frac{x^2}{2}\Big|_0^L}{\omega_0 L} = \frac{\omega_0 \frac{L^2}{2}}{\omega_0 L} = \frac{L}{2}$$

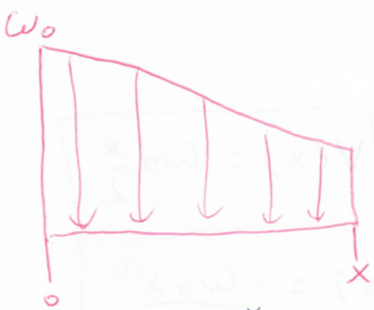
$$\rightsquigarrow F_2 = \int_0^L \frac{\omega_0}{L}(L-x)dx = \frac{\omega_0}{L}\int_0^L (L-x)dx = \frac{\omega_0}{L}\left(Lx\Big|_0^L - \frac{x^2}{2}\Big|_0^L\right)$$

$$= \frac{\omega_0}{L}\left(L^2 - \frac{L^2}{2}\right) = \frac{\omega_0 L}{2}$$

$$\rightsquigarrow x_2 = \frac{\int_0^L \frac{\omega_0}{L}(L-x)x dx}{\frac{\omega_0 L}{2}} = \frac{\frac{\omega_0}{L}}{\frac{\omega_0 L}{2}}\int_0^L (Lx - x^2)dx = \frac{2}{L^2}\left(L\frac{x^2}{2}\Big|_0^L - \frac{x^3}{3}\Big|_0^L\right)$$

$$= \frac{2}{L^2}\left(\frac{L^3}{2} - \frac{L^3}{3}\right) = \frac{2}{L^2}\left(\frac{L^3}{6}\right) = \frac{L}{3}$$

A.2 | Cálculo de Fza. equivalente usando Fn. distribución $\boxed{P2}$



$$* \ \omega(x) = \frac{\omega_0}{L}(L-x)$$

$$\rightsquigarrow F_{ef} = \int_0^x \frac{\omega_0}{L}(L-x)dx = \frac{\omega_0}{L}\int_0^x (L-x)dx$$

$$= \frac{\omega_0}{L}\left(Lx - \frac{x^2}{2}\right) = \omega_0\left(1 - \frac{x}{2L}\right)x$$

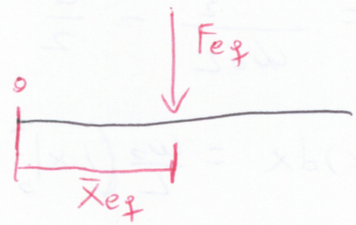
$$\rightsquigarrow \bar{X}_{ef} = \frac{\int_0^x \frac{\omega_0}{L}(L-x)x\,dx}{\omega_0\left(1-\frac{x}{2L}\right)x} = \frac{\frac{\omega_0}{L}\int_0^x (Lx - x^2)dx}{\cancel{\omega_0}\left(1-\frac{x}{2L}\right)x} = \frac{\frac{1}{L}\left(L\frac{x^2}{2} - \frac{x^3}{3}\right)}{\left(1-\frac{x}{2L}\right)x}$$

$\longrightarrow$

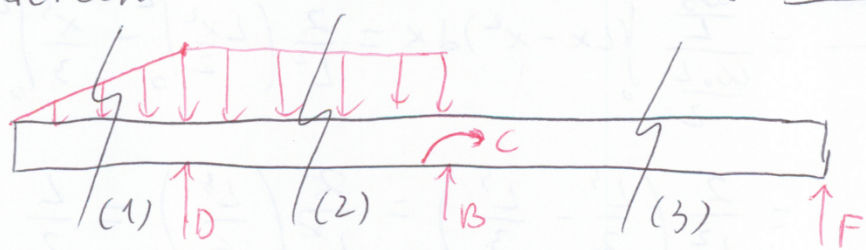
$$\bar{X}_{eq} = \frac{\frac{1}{L}\left(\frac{L}{2}-\frac{x}{3}\right)x^2}{\left(1-\frac{x}{2L}\right)x} = \frac{\left(\frac{1}{2}-\frac{x}{3L}\right)}{\left(1-\frac{x}{2L}\right)}x = \left(\frac{\frac{3L-2x}{6L}}{\frac{2L-x}{2L}}\right)x$$

$$\therefore \bar{X}_{eq} = \left(\frac{3L-2x}{2L-x}\right)\frac{x}{3}$$

* Con esas Fza y posición equivalentes es posible continuar desarrollando el ejercicio

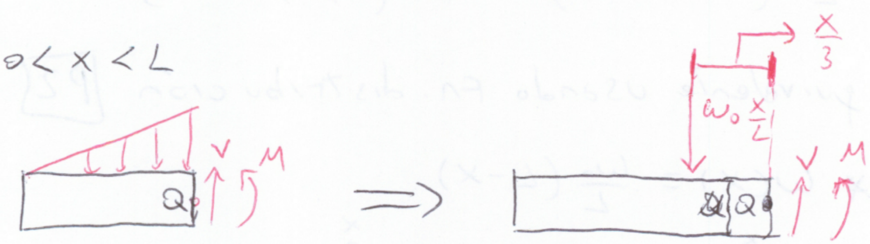


A.3 ¿Y si hiciéramos los cortes comenzando desde el lado derecho? → Demos vuelta la fig. $\boxed{P2}$



$\omega(x) = \omega_0 \frac{x}{L}$
(Lineal)

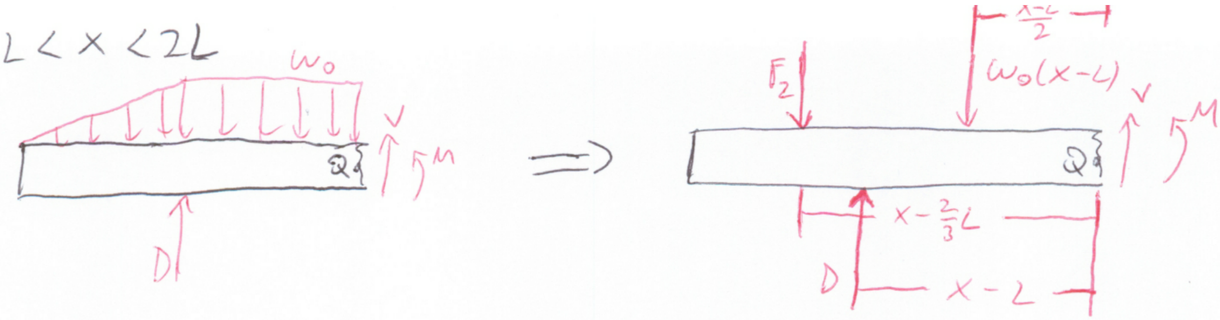
1-) $0 < x < L$



$\cdot \sum F_y = 0 \rightsquigarrow V(x) - \omega_0 \frac{x}{L} = 0 \Rightarrow \boxed{V(x) = \omega_0 \frac{x}{L}}$

$\cdot \sum_Q M_z = 0 \rightsquigarrow \frac{\omega_0 x^2}{3L} + M(x) = 0 \Rightarrow \boxed{M(x) = -\frac{\omega_0 x^2}{3L}}$

2-) $L < x < 2L$



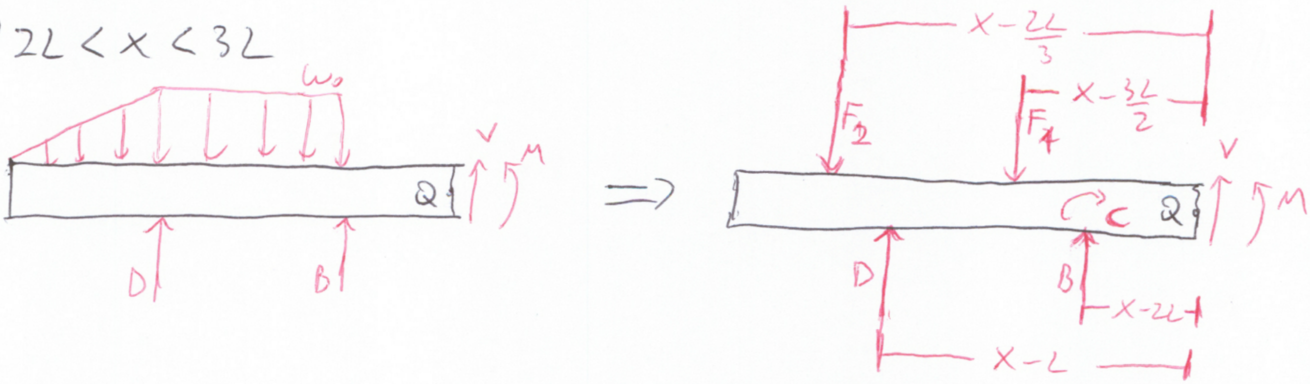
$$\sum F_y = 0 \rightsquigarrow D - F_2 - w_0(x-L) + V(x) = 0$$

$$\boxed{V(x) = w_0(x-L) + F_2 - D}$$

$$\sum_Q M_z = 0 \rightsquigarrow F_2\left(x-\tfrac{2}{3}L\right) - D(x-L) + w_0\frac{(x-L)^2}{2} + M(x) = 0$$

$$\boxed{M(x) = -\frac{w_0}{2}(x-L)^2 + D(x-L) - F_2\left(x-\tfrac{2}{3}L\right)}$$

3-) $2L < x < 3L$



$$\sum F_y = 0 \rightsquigarrow D + B - F_2 - F_1 + V = 0$$

$$\boxed{\therefore V(x) = F_1 + F_2 - (D + B)}$$

$$\sum_Q M_z = 0 \rightsquigarrow F_2\left(x-\tfrac{2L}{3}\right) + F_1\left(x-\tfrac{3L}{2}\right) - D(x-L) - B(x-2L) - C + M = 0$$

$$\boxed{\begin{aligned}\therefore M(x) = {} & D(x-L) + B(x-2L) + C \\ & - F_2\left(x-\tfrac{2L}{3}\right) - F_1\left(x-\tfrac{3L}{2}\right)\end{aligned}}$$

* Moraleja

↳ Observar el problema antes de tirarse a resolverlo