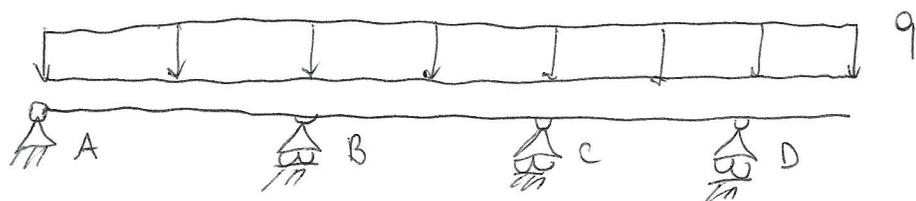


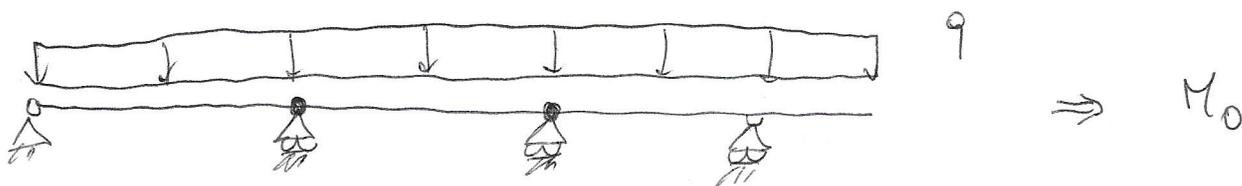
Ⓑ APPLICAZIONE DEL P.L.V. -

Schema reale



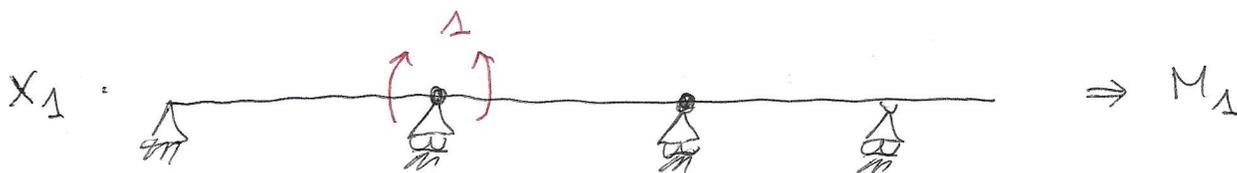
Divido lo schema reale in 3 schemi isotrofici:

Schema (0)



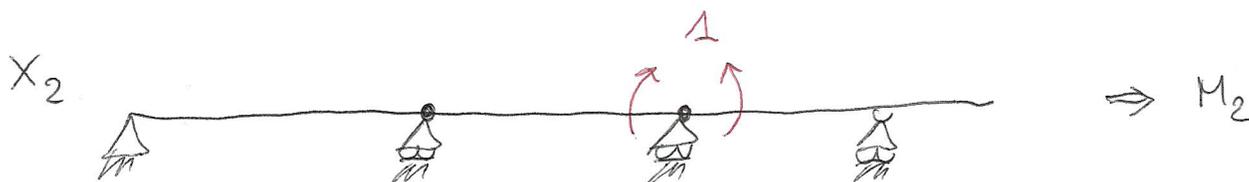
+

Schema (1)



+

Schema (2)



$$M_R = M_0 + x_1 M_1 + x_2 M_2$$

P.L.V.

$$L_e = L_i$$

$$1) \quad 1 \cdot \Delta \varphi_B = \int M_1 \cdot \chi_R ds \Rightarrow$$

$$\Rightarrow 0 = \int M_1 \left(\frac{M_R}{EI} \right) ds \Rightarrow 0 = \int M_1 (M_0 + x_1 M_1 + x_2 M_2) ds$$

$$\Rightarrow 0 = \int M_1 M_0 ds + x_1 \int M_1^2 ds + x_2 \int M_1 M_2 ds$$

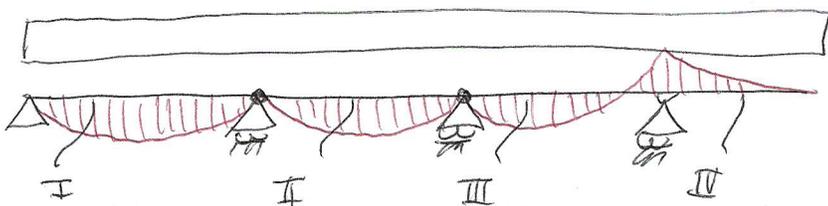
$$2) \quad 1 \cdot \Delta \varphi_C = \int M_2 \chi_R ds \Rightarrow$$

$$\Rightarrow 0 = \int M_2 \left(\frac{M_R}{EI} \right) ds \Rightarrow 0 = \int M_2 (M_0 + x_1 M_1 + x_2 M_2) ds$$

$$\Rightarrow 0 = \int M_2 M_0 ds + x_1 \int M_2 M_1 ds + x_2 \int M_2^2 ds$$

Troviamo le funzioni momento

Schema 0



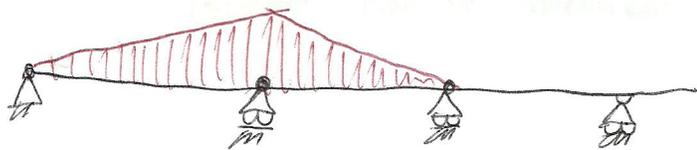
$$M_0^I = -\frac{q s^2}{2} + \frac{q e s}{2} = M_0^{II}$$

$$M_0^{III} = -\frac{q s^2}{2} + \frac{3}{8} q e s$$

M_0^{IV} è inoltre calcolabile perché $M_1^I = M_2^I = 0$ e

quindi il prodotto è zero.

Schema 1

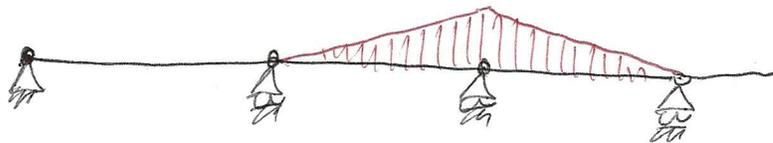


$$M_1^I = -\frac{S}{l}$$

$$M_1^{II} = \frac{S}{l} - 1$$

$$M_1^{III} = M_1^{IV} = 0$$

Schema 2



$$M_2^I = M_2^{IV} = 0$$

$$M_2^{II} = -\frac{S}{l}$$

$$M_2^{III} = \frac{S}{l} - 1$$

$$\int M_1 M_0 + x_1 \int M_1^2 + x_2 \int M_1 M_2 = 0$$

$$\int_0^l \left(-\frac{S}{l}\right) \left(-\frac{q}{2}s^2 + \frac{q}{2}ls\right) ds + \int_0^l \left(\frac{S}{l} - 1\right) \left(-\frac{q}{2}s^2 + \frac{q}{2}ls\right) ds +$$

$$+ x_1 \left[\int_0^l \left(-\frac{S}{l}\right)^2 ds + \left(\frac{S}{l} - 1\right)^2 ds \right] + x_2 \left[\int_0^l \left(\frac{S}{l} - 1\right) \left(-\frac{S}{l}\right) ds \right] = 0$$

$$\int_0^l \left(\frac{qS^2}{2l} - \frac{qS^2}{2} - \frac{qS^3}{2l} + \frac{qS^2}{2} + \frac{qS^2}{2} - \frac{qSl}{2} \right) ds +$$

$$+ x_1 \left[\int_0^l \left(\frac{S^2}{l^2} + \frac{S^2}{l^2} + 1 - 2\frac{S}{l} \right) ds \right] + x_2 \left[\int_0^l \left(-\frac{S^2}{l^2} + \frac{S}{l} \right) ds \right] = 0$$

$$\int_0^l \left(\frac{q s^2}{2} - \frac{q l s}{2} \right) ds + x_1 \int_0^1 \left(\frac{2 s^2}{l^2} - \frac{2 s}{l} + 1 \right) ds +$$

$$+ x_2 \int_0^l \left(-\frac{s^2}{l^2} + \frac{s}{l} \right) ds = 0$$

$$\frac{q l^3}{6} - \frac{q l^3}{4} + x_1 \left(\frac{2}{3} l - l + l \right) + x_2 \left(-\frac{l}{3} + \frac{l}{2} \right) = 0$$

$$\frac{2-3}{12} q l^3 + \frac{2}{3} l x_1 + \frac{-2+3}{6} l x_2 = 0$$

$$\Rightarrow \boxed{-\frac{q l^3}{12} + \frac{2}{3} l x_1 + \frac{1}{6} l x_2 = 0} \quad 1^{\text{e}} \text{ equazione}$$

$$\int M_2 M_0 + x_1 \int M_2 M_1 + x_2 \int M_2^2 = 0$$

$$\int_0^l \left(-\frac{q s^2}{2} + \frac{q l s}{2} \right) \left(-\frac{s}{l} \right) ds + \left(-\frac{q l^2}{2} + \frac{3}{8} q l s \right) \left(\frac{s}{l} - 1 \right) ds +$$

$$+ x_1 \left(-\frac{l}{3} + \frac{l}{2} \right) + x_2 \left(\int_0^l \left(-\frac{s^2}{l^2} + \left(\frac{s}{l} - 1 \right)^2 \right) ds \right) = 0$$

$$\int_0^l \left(\frac{q s^3}{2l} - \frac{q s^2}{2} - \frac{q s^3}{2l} + \frac{q s^2}{2} + \frac{3}{8} q s^2 - \frac{3}{8} q l s \right) +$$

$$+ x_1 \left(-\frac{2+3}{6} l \right) + x_2 \left(\int_0^l \left(\frac{s^2}{l^2} + \frac{s^2}{l^2} + 1 - \frac{2s}{l} \right) ds \right) = 0$$

$$\Rightarrow \frac{3}{8} q \frac{l^3}{3} - \frac{3}{8} q l - \frac{l^2}{2} + x_1 \frac{l}{6} + x_2 \left(\frac{2}{3} l + l - l \right) = 0$$

$$\Rightarrow \frac{q l^3}{8} - \frac{13}{16} q l^3 + \frac{l}{6} x_1 + \frac{2}{3} l x_2 = 0$$

$$\Rightarrow \frac{2-3}{16} q l^3 + \frac{l}{6} x_1 + \frac{2}{3} l x_2 = 0$$

$$\Rightarrow \boxed{-\frac{q l^3}{16} + \frac{l}{6} x_1 + \frac{2}{3} l x_2 = 0} \quad 2^{\text{e}} \text{ equazione}$$

Si arriva alle stesse 2 equazioni!