

$\frac{dT}{ds} + T = 0 \Rightarrow T = -\frac{dM}{ds}$
 $\frac{dT}{ds} + q_l = 0$ ESTIMANDO $T = -\frac{dM}{ds} \Rightarrow \frac{d}{ds} \left(-\frac{dM}{ds} \right) + q_l = 0$
 \downarrow
 $-\frac{d^2M}{ds^2} + q_l = 0$
 $\chi = \frac{d\varphi}{ds}$ MA SE $\varphi(s) = \frac{dv}{ds} \Rightarrow \chi = \frac{d^2v}{ds^2}$
 $M = EI \cdot \chi \Rightarrow M = EI \cdot \frac{d^2v}{ds^2}$ ASSISSO SOSTITUIAMO NELLA Π ORIGINALE
 $-\frac{d^4v}{ds^4} + \frac{q_l}{EI} = 0 \Rightarrow \frac{d^4v}{ds^4} = \frac{q_l}{EI}$
 Da questa adesso integriamo
 $\frac{d^3v}{ds^3} = -\frac{q_l}{EI} v'''$
 $\frac{d^2v}{ds^2} = -\frac{q_l}{EI} s^2 + C_1 v''$
 $\frac{dv}{ds} = -\frac{q_l}{6EI} s^3 + C_1 s + C_2 v'$
 $\frac{dv}{ds} = -\frac{q_l}{6EI} s^3 + C_1 s + C_2 v'$
 $\frac{dv}{ds} = -\frac{q_l}{6EI} s^3 + C_1 s + C_2 v'$

$v'' = -\frac{q_l}{24EI} s^4 + C_1 \frac{s^3}{6} + C_2 \frac{s^2}{2} + C_3 s + C_4 v''$
 CONDIZIONI AL CANTOINIZIO
 In A (incastro) $v''(A) = 0$ $\varphi(A) = 0 \Rightarrow v'(A) = 0$
 In B (carrullo) $v(A) = 0$ $\varphi(B) \neq 0 \Rightarrow M(B) \neq 0 \Rightarrow v''(B) = 0$
 Le cond. al cant. sono 4:
 $v(A) = 0$ $v'(A) = 0$ $v''(A) = 0$ $v''(B) = 0$
 SOSTITUIAMO NELLE EQ. E ADDIAMO:
 $v(A) = C_4$ $v'(A) = C_3$
 $v''(A) = -\frac{q_l}{24EI} l^4 + C_1 \frac{l^3}{6} + C_2 \frac{l^2}{2} + C_3 l + C_4$
 $v''(B) = -\frac{q_l}{24EI} l^4 + C_1 \frac{l^3}{6} + C_2 \frac{l^2}{2} + C_3 l + C_4$
 $v''(A) = 0$ $v''(B) = 0 \Rightarrow C_1 = \frac{q_l l^4}{24EI} - C_2 l - C_4$
 $-\frac{q_l}{24EI} l^4 + C_1 \frac{l^3}{6} + \left(\frac{q_l l^4}{24EI} - C_2 l - C_4 \right) \frac{l^2}{2} + C_3 l + C_4 = 0$
 $\Rightarrow -\frac{q_l}{24EI} l^4 + C_1 \frac{l^3}{6} + \frac{q_l l^5}{48EI} - \frac{C_2 l^3}{2} - C_4 \frac{l^2}{2} + C_3 l + C_4 = 0$
 $\Rightarrow -\frac{q_l l^4}{24EI} + \frac{q_l l^5}{48EI} - \frac{C_2 l^3}{2} - C_4 \frac{l^2}{2} + C_3 l + C_4 = 0$
 $C_1 \frac{l^3}{3} = \frac{5 q_l l^4}{24EI} \Rightarrow C_1 = \frac{5 q_l l}{8EI}$
 $C_2 = \frac{q_l l^2}{24EI} - \frac{5 q_l l^2}{8EI} \Rightarrow C_2 = \frac{q_l l^2 - 15 q_l l^2}{24EI} \Rightarrow C_2 = -\frac{14 q_l l^2}{24EI}$
 I VALORI TROVATI SONO:
 $C_1 = \frac{5 q_l l}{8EI}$ $C_2 = -\frac{14 q_l l^2}{24EI}$ $C_3 = 0$ $C_4 = 0$

SPOSTAMENTO $v(s)$ MAX
 IMPOSTO CHE $v'(s) = 0$ TROVO s^* E LA SOSTITUISCO IN $v(s)$
 $-\frac{q_l}{24EI} s^4 + \frac{5 q_l l}{8EI} s^3 - \frac{14 q_l l^2}{24EI} s^2 = 0$ RACCOLIAMO:
 $\frac{q_l s}{24EI} \left(-\frac{q_l s^3}{24EI} + \frac{5 q_l l s^2}{8EI} - \frac{14 q_l l^2}{24EI} \right) = 0$ RISOLVO L'EQ. DI 2° GRADO
 $s = -b \pm \sqrt{b^2 - 4ac}$
 $-\frac{5 q_l s}{8EI} \pm \sqrt{\frac{25 q_l^2 s^2}{64EI^2} - 4 \left(\frac{q_l s^2}{24EI} - \frac{14 q_l l^2}{24EI} \right)}$ LA 1° SOLUZ. $s = 0 \Rightarrow$
 $-\frac{5 q_l}{8EI} \pm \sqrt{\frac{25 q_l^2}{64EI^2} - 4 \left(\frac{q_l s^2}{24EI} - \frac{14 q_l l^2}{24EI} \right)}$ LA 2° SOLUZ. $s = 0 \Rightarrow$
 $\Rightarrow \left(\frac{5 q_l}{8EI} \pm \sqrt{\frac{25 q_l^2}{64EI^2} - 4 \left(\frac{q_l s^2}{24EI} - \frac{14 q_l l^2}{24EI} \right)} \right) \cdot \frac{3}{2} \Rightarrow (0,055 l \pm 0,20 l) \cdot (-15)$
 1° SOLUZIONE = 1,055 l MA > l QUINDI NON VA
 2° SOLUZIONE = 0,555 l QUINDI VA
 ANDANDO A SOSTITUIRE
 $v(0,555 l) = -\frac{q_l}{24EI} (0,555 l)^4 + \frac{5 q_l l}{8EI} (0,555 l)^3 - \frac{14 q_l l^2}{24EI} (0,555 l)^2$
 DEFORMAZIONE

SOSTITUIAMO I VALORI DELLE "C" PER TROVARE $v(s)$ E $\varphi(s)$
 $v(s) = -\frac{q_l}{24EI} s^4 + \frac{5 q_l l}{8EI} s^3 - \frac{14 q_l l^2}{24EI} s^2$
 $\varphi(s) = -\frac{q_l}{24EI} s^3 + \frac{5 q_l l}{8EI} s^2 - \frac{14 q_l l^2}{24EI} s$
 $\varphi(s) = -\frac{q_l}{24EI} s^3 + \frac{5 q_l l}{8EI} s^2 - \frac{14 q_l l^2}{24EI} s$
 $\varphi(s) = -\frac{q_l}{24EI} s^3 + \frac{5 q_l l}{8EI} s^2 - \frac{14 q_l l^2}{24EI} s$
 $M(s) = v'' \cdot EI$ CALCOLO:
 $\left(-\frac{q_l}{24EI} s^3 + \frac{5 q_l l}{8EI} s^2 - \frac{14 q_l l^2}{24EI} s \right) \cdot EI \Rightarrow$
 $M(s) = -\frac{q_l}{24} s^3 + \frac{5 q_l l}{8} s^2 - \frac{14 q_l l^2}{24} s$
 SAPENDO CHE IL TAGLIO = $v''' \cdot EI$
 $T = \left(-\frac{3 q_l}{24EI} s^2 + \frac{10 q_l l}{8EI} s - \frac{14 q_l l^2}{24EI} \right) \cdot EI \Rightarrow$
 $T(s) = -\frac{q_l}{8} s^2 + \frac{5 q_l l}{2} s - \frac{14 q_l l^2}{24}$
 DIAGRAMMI DI T E M

