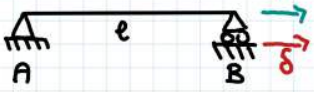
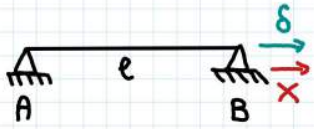
COEFFICIENTI ELASTICI di STRUTTURE ELEMENTARI

1



$$\delta_B = \frac{F\ell}{EA}$$

2



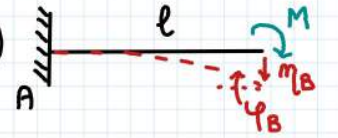
$$X = \frac{EA}{\ell}\cdot\delta$$

3

$$\varphi_B = -\frac{F\ell^2}{2EI}$$

$$\eta_B = \frac{F\ell^3}{3EI}$$

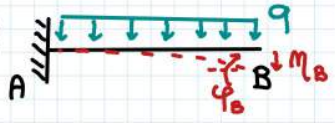
4



$$\varphi_B = -\frac{M\ell}{EI}$$

$$\eta_B = \frac{M\ell^2}{2EI}$$

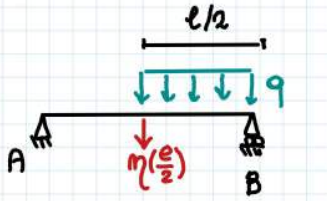
5



$$\varphi_B = -\frac{q\ell^3}{6EI}$$

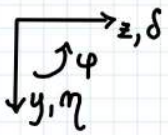
$$\eta_B = \frac{q\ell^4}{8EI}$$

6

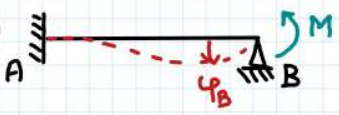


$$\eta\left(\frac{\ell}{2}\right) = \frac{5}{768}\frac{q\ell^4}{EI}$$

convenzione ⊕

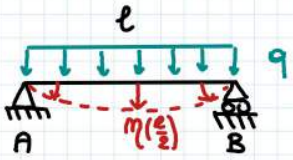


7



$$\varphi_B = \frac{M\ell}{4EI}$$

8



$$\varphi_A = -\frac{q\ell^3}{24EI}$$

$$\varphi_B = +\frac{q\ell^3}{24EI}$$

$$\eta\left(\frac{\ell}{2}\right) = \frac{5}{384}\frac{q\ell^4}{EI}$$

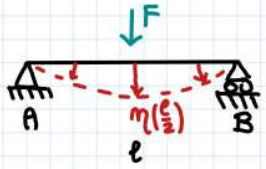
9

$$\varphi_A = +\frac{M\ell}{6EI}$$

$$\varphi_B = -\frac{M\ell}{3EI}$$

$$\eta\left(\frac{\ell}{2}\right) = -\frac{M\ell^2}{16EI}$$

10

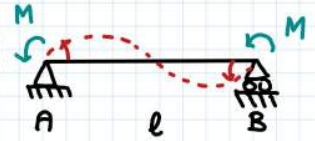


$$\varphi_A = -\frac{F\ell^2}{16EI}$$

$$\varphi_B = +\frac{F\ell^2}{16EI}$$

$$\eta\left(\frac{\ell}{2}\right) = \frac{F\ell^3}{48EI}$$

11

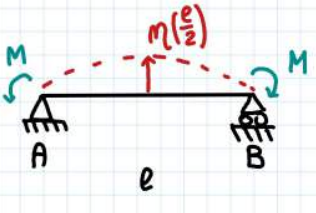


$$\varphi_A = \frac{M\ell}{6EI}$$

$$\varphi_B = \frac{M\ell}{6EI}$$

$$\eta\left(\frac{\ell}{2}\right) = 0$$

12



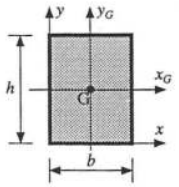
$$\varphi_A = \frac{M\ell}{2EI}$$

$$\varphi_B = -\frac{M\ell}{2EI}$$

$$\eta\left(\frac{\ell}{2}\right) = -\frac{M\ell^2}{8EI}$$

PROPRIETA' GEOMETRICHE di alcune AREE PIANE

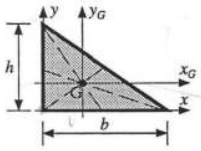
SEZIONI PIENE



$A = bh$ $\quad x_G = \frac{1}{2}b$ $\quad y_G = \frac{1}{2}h$

$I_{x_Gx_G} = \frac{1}{12}bh^3$ $\quad I_{y_Gy_G} = \frac{1}{12}b^3h$ $\quad I_{x_Gy_G} = 0$

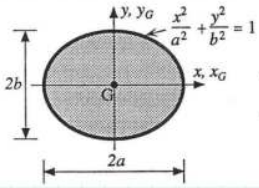
$I_{xx} = \frac{1}{3}bh^3$ $\quad I_{yy} = \frac{1}{3}b^3h$ $\quad I_{xy} = \frac{1}{4}b^2h^2$



$A = \frac{1}{2}bh$ $\quad x_G = \frac{1}{3}b$ $\quad y_G = \frac{1}{3}h$

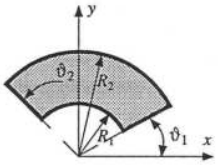
$I_{x_Gx_G} = \frac{1}{36}bh^3$ $\quad I_{y_Gy_G} = \frac{1}{36}b^3h$ $\quad I_{x_Gy_G} = -\frac{1}{72}b^2h^2$ POSITIVO se

$I_{xx} = \frac{1}{12}bh^3$ $\quad I_{yy} = \frac{1}{12}b^3h$ $\quad I_{xy} = \frac{1}{24}b^2h^2$



$A = \pi ab$ $\quad x_G = 0$ $\quad y_G = 0$

$I_{x_Gx_G} = I_{xx} = \frac{1}{4}\pi ab^3$ $\quad I_{y_Gy_G} = I_{yy} = \frac{1}{4}\pi a^3b$ $\quad I_{x_Gy_G} = I_{xy} = 0$



$A = \frac{1}{2}(R_2^2 - R_1^2)(\vartheta_2 - \vartheta_1)$

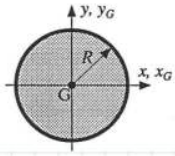
$S_x = \frac{1}{3}(R_2^3 - R_1^3)(-\cos\vartheta_2 + \cos\vartheta_1)$ $\quad S_y = \frac{1}{3}(R_2^3 - R_1^3)(\sin\vartheta_2 - \sin\vartheta_1)$

$I_{xx} = \frac{1}{8}(R_2^4 - R_1^4)(\vartheta_2 - \vartheta_1 - \sin\vartheta_2\cos\vartheta_2 + \sin\vartheta_1\cos\vartheta_1)$

$I_{yy} = \frac{1}{8}(R_2^4 - R_1^4)(\vartheta_2 - \vartheta_1 + \sin\vartheta_2\cos\vartheta_2 - \sin\vartheta_1\cos\vartheta_1)$

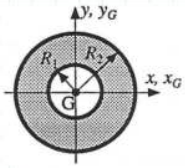
$I_{xy} = \frac{1}{16}(R_2^4 - R_1^4)(-\cos2\vartheta_2 + \cos2\vartheta_1)$

Casi particolari:



$A = \pi R^2$ $\quad x_G = 0$ $\quad y_G = 0$

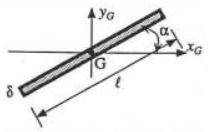
$I_{x_Gx_G} = I_{xx} = \frac{1}{4}\pi R^4$ $\quad I_{y_Gy_G} = I_{yy} = \frac{1}{4}\pi R^4$ $\quad I_{x_Gy_G} = I_{xy} = 0$



$A = \pi(R_2^2 - R_1^2)$ $\quad x_G = 0$ $\quad y_G = 0$

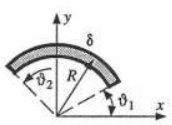
$I_{x_Gx_G} = I_{xx} = \frac{1}{4}\pi(R_2^4 - R_1^4)$ $\quad I_{y_Gy_G} = I_{yy} = \frac{1}{4}\pi(R_2^4 - R_1^4)$ $\quad I_{x_Gy_G} = I_{xy} = 0$

SEZIONI SOTTILI ($\delta << \ell$)



$A = \delta\ell$ $\quad x_G = 0$ $\quad y_G = 0$

$I_{x_Gx_G} = \frac{1}{12}\delta\ell^3\sin^2\alpha$ $\quad I_{y_Gy_G} = \frac{1}{12}\delta\ell^3\cos^2\alpha$ $\quad I_{x_Gy_G} = \frac{1}{12}\delta\ell^3\sin\alpha\cos\alpha$



$A = (\vartheta_2 - \vartheta_1)\,\delta R$

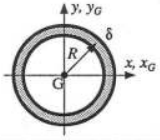
$S_x = (-\cos\vartheta_2 + \cos\vartheta_1)\,\delta R^2$ $\quad S_y = (\sin\vartheta_2 - \sin\vartheta_1)\,\delta R^2$

$I_{xx} = \frac{1}{2}(\vartheta_2 - \vartheta_1 - \sin\vartheta_2\cos\vartheta_2 + \sin\vartheta_1\cos\vartheta_1)\,\delta R^3$

$I_{yy} = \frac{1}{2}(\vartheta_2 - \vartheta_1 + \sin\vartheta_2\cos\vartheta_2 - \sin\vartheta_1\cos\vartheta_1)\,\delta R^3$

$I_{xy} = \frac{1}{4}(-\cos2\vartheta_2 + \cos2\vartheta_1)\,\delta R^3$

Casi particolari:



$A = 2\pi\delta R$ $\quad x_G = 0$ $\quad y_G = 0$

$I_{x_Gx_G} = I_{xx} = \pi\delta R^3$ $\quad I_{y_Gy_G} = I_{yy} = \pi\delta R^3$ $\quad I_{x_Gy_G} = I_{xy} = 0$