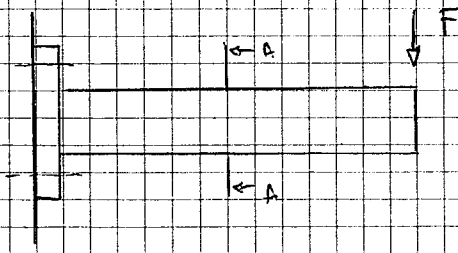
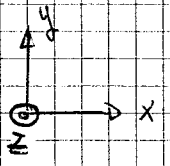
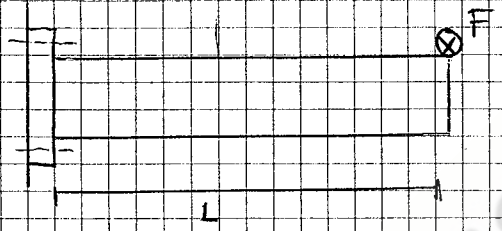
ESAME 20/07/2011

ESERCIZIO (3)

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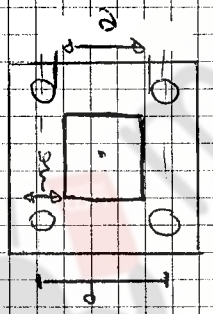








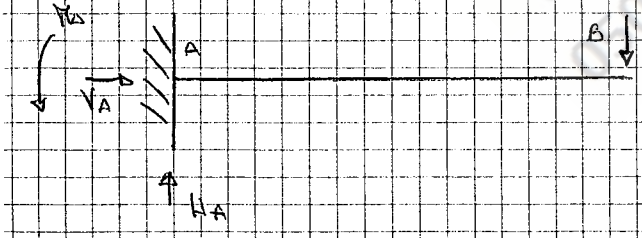
A-A

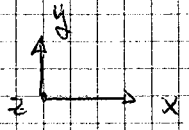


$L = 1500$ mm
$b = 200$ mm
$a = 150$ mm
$d = 180$ mm
$t = 10$ mm
$\sigma_b = 1100$ MPa
(tensione limite bullone)
$f = 0,3$
$\gamma_{R,N} = 1,5$

Trovare valore massimo di F

Assimilo ad una trave piana:

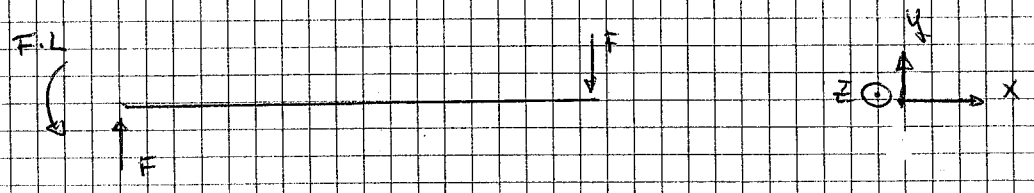




$$\begin{cases} V_A = 0 \\ H_A = F \\ M_A = F \cdot L \end{cases}$$

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Quindi diagramma di corpo libero dell'intero:



CARATTERISTICHE della SOLLECITAZIONE:

NORMALE → NULLA

TAGLIO → $T_y = -F$

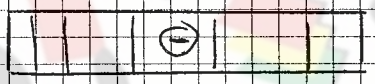
MOMENTO FLETTENTE → $M_z + FL - F \cdot z = 0$

$M_z = Fz - FL$

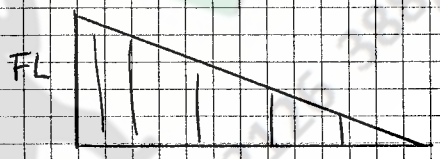
MOMENTO TORCENTE → $M_x = -F\frac{a}{2}$

DIAGRAMMI:

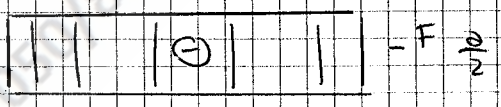
TAGLIO



MOMENTO FLETTENTE M_z



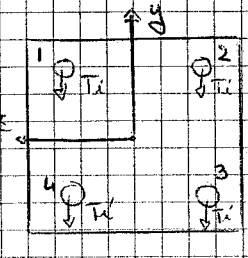
MOMENTO TORCENTE M_x



VEDIAMO l'effetto sui bulloni:

TAGLIO T_y:

Dà una azione di scorrimento → forza del tipo T

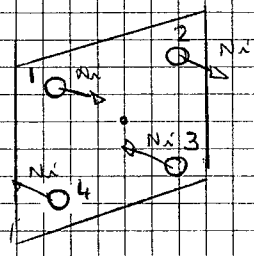


$$T_i = \frac{T_y}{n_b} = -\frac{F}{4}$$

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MOMENTO FLETTENTE

PROVOCA una forza di taglio di Tipo N



N_{iz} = forza N nodata dal momento M_z

$$N_{iz} = \frac{M_z}{\sum y_i^2} y_i$$

la distanza lungo y per i bulloni è:

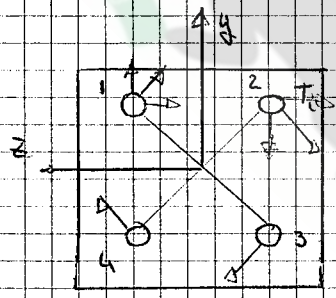
$y_i = \frac{d}{2}$ per 1 e 2

$y_i = -\frac{d}{2}$ per 3 e 4

$$N_{iz} = \frac{FL}{2 \cdot \frac{d^2}{4}} \cdot \frac{d}{2} = \frac{FL}{2d} \quad \text{per 1 e 2}$$

$$N_{iz} = -\frac{FL}{2d} \quad \text{per 3 e 4}$$

MOMENTO TORCENTE:



Si genera una forza di scorrimento → Tipo T

T_{ix} = taglio dato al momento M_x

NB → per l'approccio contabilistico supponga che tutti i bulloni siano sottopasti allo stesso sforzo di taglio data dalla somma dei moduli dei tagli. Quindi la verifica la farei fare su 1 e 2 e 2.

In realtà andando a valere la scomposizione dello sforzo tagliante generato dal momento Torcente vedo che lungo y le componenti si annullano per il bullone 1 mentre si sommano per il bullone 2 in questa risultata

quello più sollecitato

$$T_{xi} = \frac{M_x}{\sum x_i^2} \cdot x_i$$

x_i è la diagonale di un quadrato di lato d

$$x_i = \frac{d}{2}\sqrt{2}$$

$$T_{xi} = -\frac{F\frac{a}{2}}{4\left(\frac{d}{2}\sqrt{2}\right)^2} \cdot \frac{d}{2}\sqrt{2} = -\frac{F\frac{ad\sqrt{2}}{4}}{4\frac{d^2}{4}\cdot 2} = -F\frac{a}{d}\frac{\sqrt{2}}{8}$$

Approccio cautelativo: su ogni bullone ho lo stesso taglio data dalla somma dei moduli:

$$T = |T_{yi}| + |T_{xi}| = \frac{F}{4} + F\frac{a}{d}\frac{\sqrt{2}}{8} = 0{,}397\ F$$

$$N = \frac{FL}{2d} = 4{,}167\ F$$

VERIFICA:

$$T \le f\ \frac{N_0 - N_i}{\varphi}\ n_s \qquad n_s = 1$$

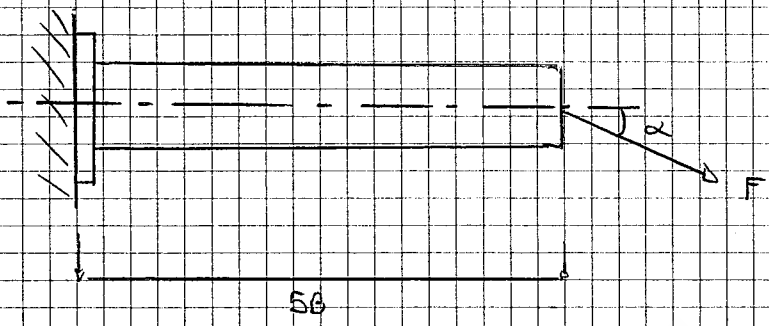
$N_0 = 0{,}8\ \sigma_{snervamento}\ A_{bullone} = 0{,}8 \cdot 1100 \cdot \pi\frac{\phi^2}{4} = 63115\ N$

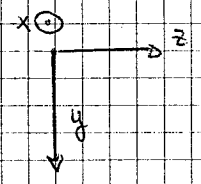
VERIFICA (per trovare la F limite metto l'uguale)

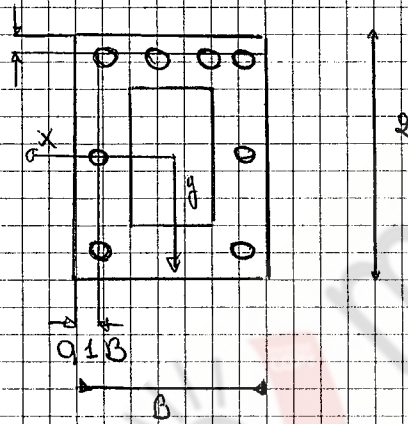
$$0{,}397\ F = \frac{0{,}3}{1{,}5}\left(63115 - 4{,}167\ F\right)$$

ESAME 8/01/2009

ESERCIZIO (2)



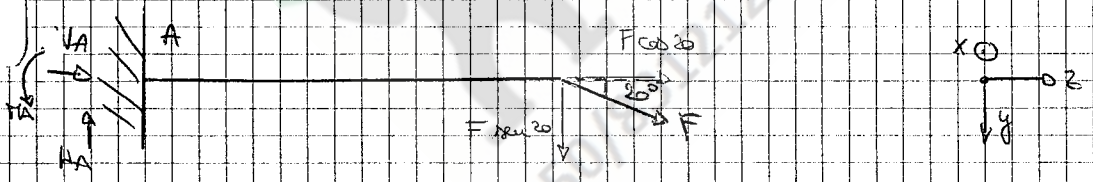




$\alpha = 20°$

Calcolare il massimo modulo di F

Studio la trave e le sollecitazioni ad essa:



$z]\quad V_A + F\cos(20) = 0 \qquad V_A = -F\cos 20$

$y]\quad -H_A + F\,\text{sen}\,20 = 0 \qquad H_A = F\,\text{sen}\,20$

Momento (A) $M_A - F\,\text{sen}\,20 \cdot 5B = 0$

$M_A = F\,\text{sen}\,20 \cdot 5B$

Graficamente

