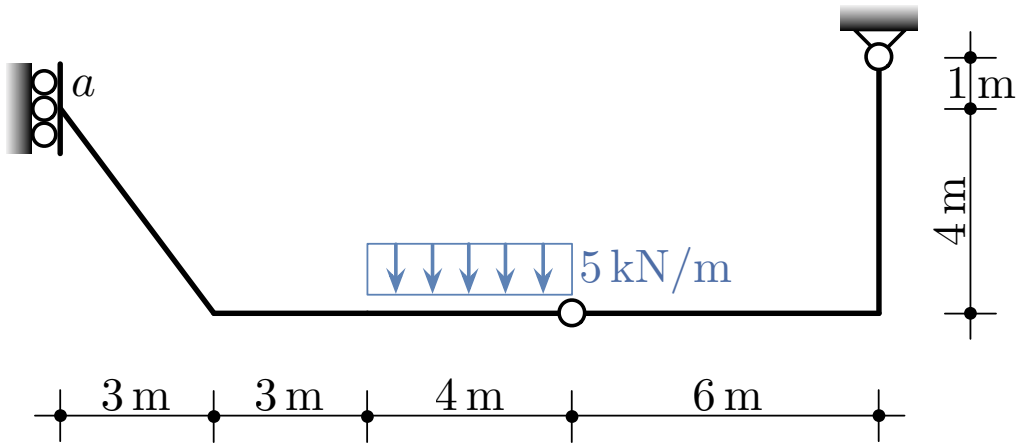
FONDAMENTI DI MECCANICA DELLE STRUTTURE

(docente: G. FORMICA)

PROVA di VERIFICA – 27 novembre 2017

STUDENTE: traccia **B**



Parte 1

Del sistema isostatico rappresentato in figura, si chiede di:

1.1. determinare il valore delle reazioni vincolari con il metodo dei corpi liberi.

1.2. verificare il valore della reazione vincolare **a rotazione** $\boldsymbol{R}_{\mathrm{m}}(a)$ fornita dal **pattino in** $\boldsymbol{a}$, utilizzando il metodo della potenza.

1.3. tracciare i grafici delle caratteristiche della sollecitazione (N, T, M).

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27/11/2017

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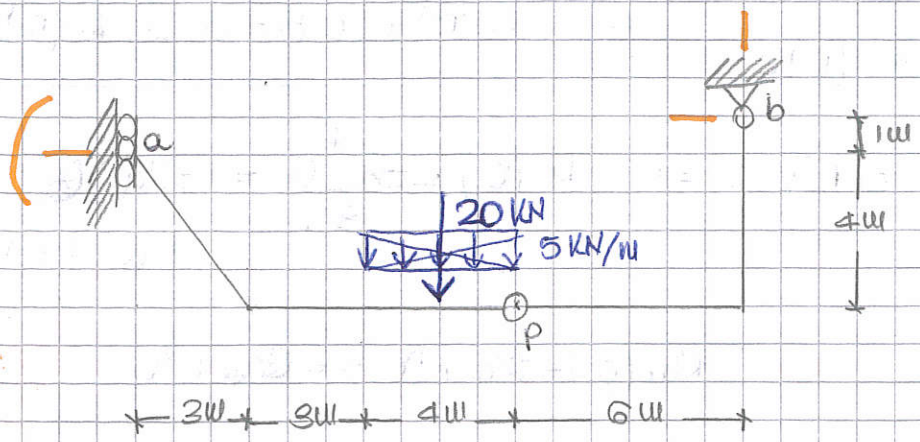
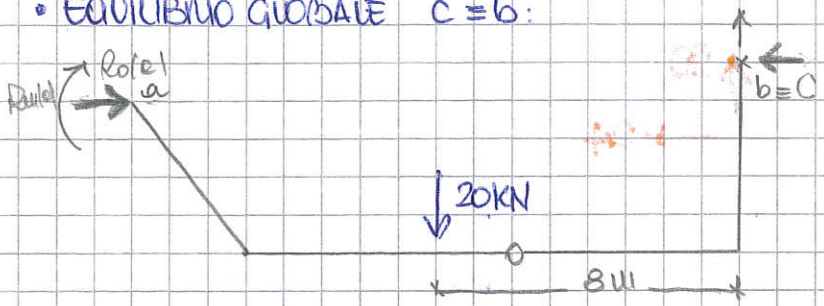


1.1. Determinare il valore delle reazioni vincolari con il metodo dei corpi liberi.

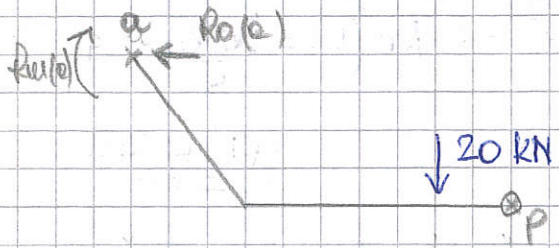
- EQUILIBRIO GLOBALE $C \equiv b$:



- $\Sigma M_{c\equiv b} = 0 \Rightarrow \quad 20 \cdot 8 - Rw(a) + Ro(a) \cdot 1 = 0$

- $\Sigma F_O = 0 \Rightarrow \quad Ro(a) - Ro(b) = 0$
- $\Sigma F_V = 0 \Rightarrow \quad 20 - Rv(b) = 0 \Rightarrow \quad \boxed{Rv(b) = 20}$

- EQUILIBRIO LOCALE a SX $P \equiv C$:



- $\Sigma M_{C\equiv P} = 0 \Rightarrow \quad 20 \cdot 2 + Ro(a) \cdot 4 - Rw(a) = 0$
- $\Sigma F_O = 0 \Rightarrow \quad Ro(a) - Ro(P) = 0$
- $\Sigma F_V = 0 \Rightarrow \quad 20 - Rv(P) = 0$

$$\begin{cases} 20 \cdot 8 - Rw(a) + Ro(a) = 0 \\ 20 \cdot 2 - Ro(a) \cdot 4 - Rw(a) = 0 \end{cases}$$

$$\begin{cases} R_{u}(a) = R_0(a) + 20\cdot 8 \\ R_{u}(a) = 20\cdot 2 - R_0(a)\,4 \end{cases} \Rightarrow \quad R_0(a) + 20\cdot 8 = 20\cdot 2 - R_0(a)\,4$$

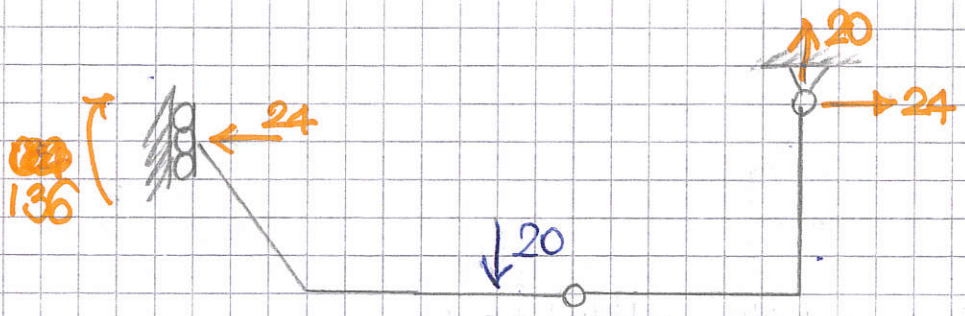
$$\Rightarrow R_0(a) = -20\cdot 8 + 20\cdot 2 \Rightarrow \quad R_0(a) = \frac{-20\cdot 6}{5} = -24$$

(*) → cambio verso

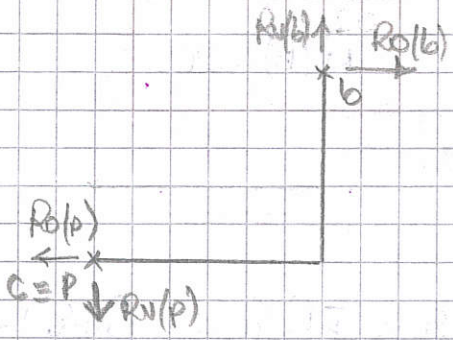
$$R_0(a) = R_0(b) = 24$$

$$R_{u}(a) = -24 + 20\cdot 8 = 136$$

$$R_{v}(b) = 20$$



EQUILIBRIO A DX $P \equiv C$ [VERIFICA]



$$\sum M_{C\equiv P} = 0 \Rightarrow \quad R_0(b)\,5 - R_{v}(b)\,6 = 0$$

(↺) (↻)

$$\begin{cases} R_{v}(b) = 20 \\ R_0(b)\,5 = 20\cdot 6 \end{cases} \Rightarrow R_0(b) = \frac{20\cdot 6}{5} = 24$$

VERIFICATO!

(*) VERIFICA $R_0(a)$

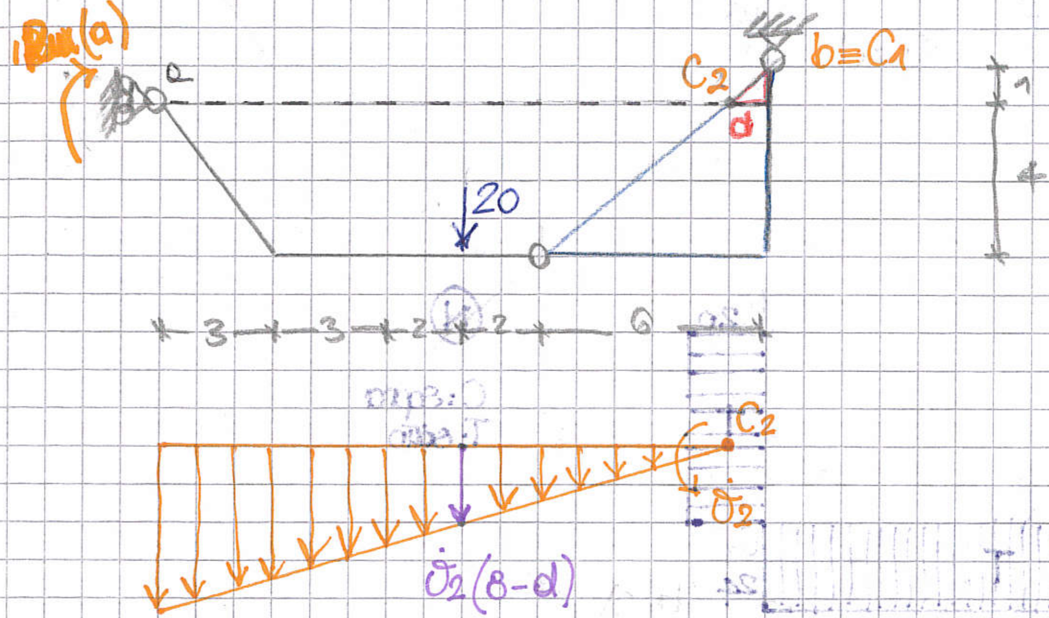
$$R_0(a) = -24$$

$$20\cdot 8 - R_{u}(a) + 20\cdot 6 = 0 \Rightarrow \quad R_{u}(a) = 20\cdot 8 + R_0(a) =$$

$$= 20\cdot 8 - 24 = 136 \quad \text{ok!}$$

Quindi $R_0(a) = 24$ con verso ←

1.2 Verificare il valore della reazione vincolare a Rotazione $R_w(a)$ fornito dal potere in a utilizzando il metodo delle potenze.



$$5 : 6 = 1 : d \Rightarrow \quad d = \frac{6}{5}$$

$$\dot\vartheta_2(8-d) = \dot\vartheta_2\left(8-\frac{6}{5}\right) = \dot\vartheta_2\left(\frac{40-6}{5}\right) = \frac{34}{5}$$

$$\Pi = 20 \cdot \dot\vartheta_2 \cdot \frac{34}{5} - R_w(a)\,\dot\vartheta_2 = 0$$

$$R_w(a) = \frac{20 \cdot 34}{5} = 136$$ VERIFICATO

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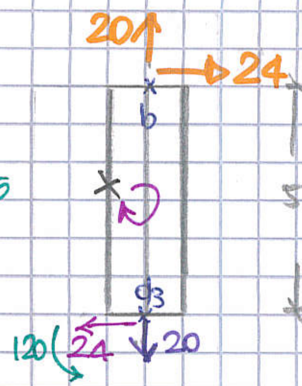
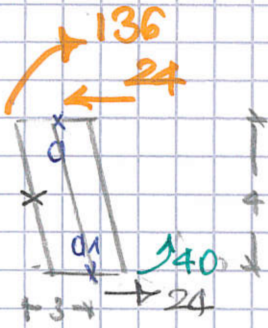
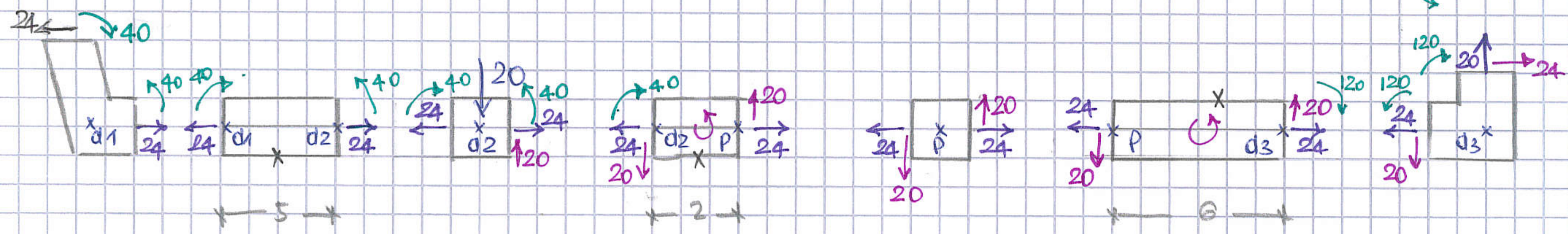
- RV
- TAGLIO
- MOMENTO
- NORMALE



$M_1 = 24 \cdot 5$

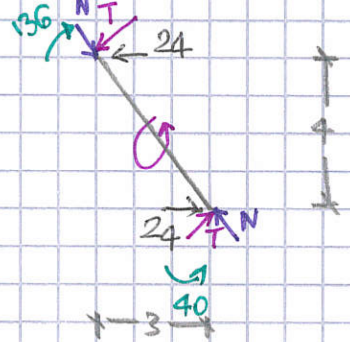


$M_4 \text{ (in a)} = 40 + 24 \cdot 4 = 136$



$M_3 = 20 \cdot 2$ (in d2)

$M_2 = 120 - 20 \cdot 6 = 0$ (in p)



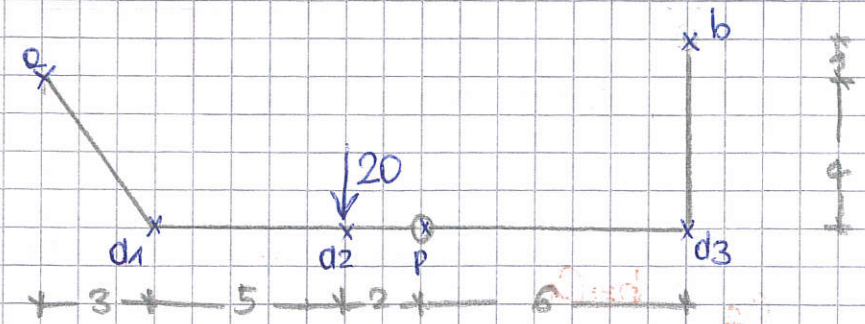
$b = 5$

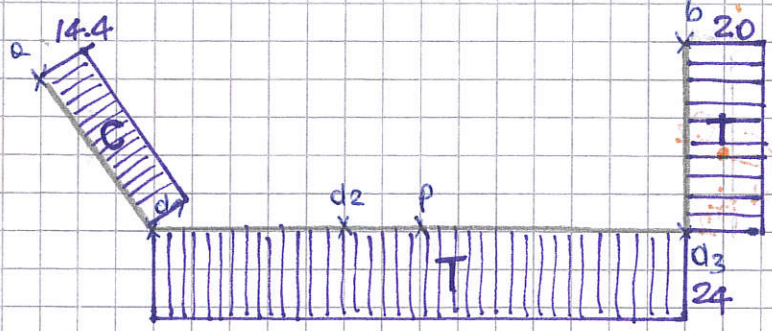
$40 - 136 + T5 = 0$

$T = \frac{136 - 40}{5} = 19.2$

$N = \sqrt{24^2 - (19.2)^2} = \sqrt{207.36} = 14.4$

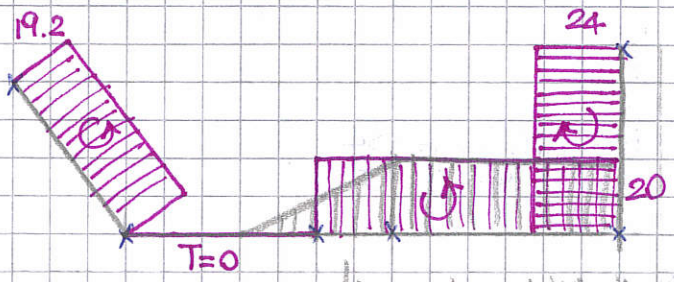
1.3. Tracciare i grafici delle caratteristiche della sollecitazione (N, T, M).





(N)

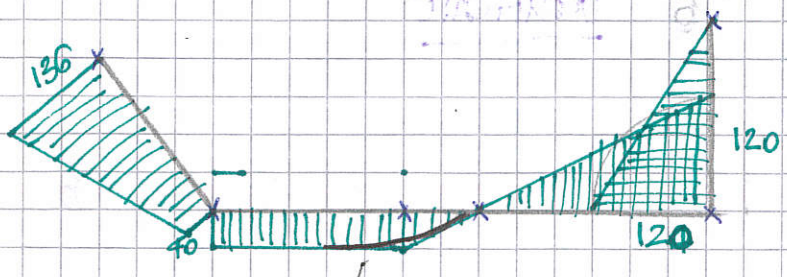
C: sopra
T: sotto



↳ carico distribuito

(T)

↻: sopra
↺: sotto



(M)

— carico distribuito