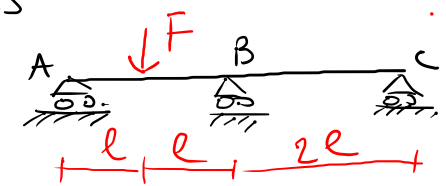
LES

$g = 3, \nu = 3, s = 2$: STR LABILE

7/4/22



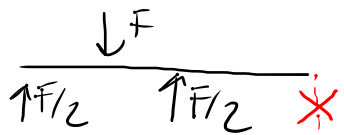
AFFRONTO IL PROBLEMA STATICO

$$\begin{cases} \rightarrow : \quad 0 = 0 \quad \text{(IDENTITA')} \\ +\uparrow : \quad V_A + V_B + V_C - F = 0 \\ +\circlearrowleft_A : \quad -F\ell + V_B 2\ell + V_C 4\ell = 0 \end{cases}$$

STATICAMENTE INDETERMINATO

2 EQ. IN 3 INCOGNITE

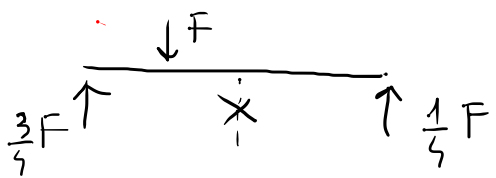
$\Rightarrow$ INFINITE SOLUZ.



PRIMA SOLUZ. PROPOSTA

$V_A = \frac{F}{2}, \quad V_B = \frac{F}{2}, \quad V_C = 0$

$$\begin{cases} F + 0 - F = 0 \quad \text{OK} \\ -F\ell + F\ell + 0 = 0 \quad \text{OK} \end{cases}$$



SECONDA SOLUZ PROPOSTA

$V_A = \frac{3}{4}F, \quad V_B = 0, \quad V_C = \frac{1}{4}F$

$$\begin{cases} \frac{3}{4}F + 0 + \frac{1}{4}F - F = 0 \quad \text{OK} \\ -F\ell + 0 + \frac{1}{4}F \cdot 4\ell = 0 \quad \text{OK} \end{cases}$$

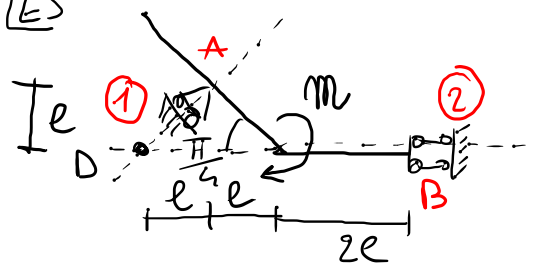
CLASSIFICAZIONE DEI PROBLEMI STATICI (P.S.)

- P.S. STATICAMENTE IMPOSSIBILE : LE EQ. DEL SISTEMA NON SONO SODDISFATTE ; NON ESISTE UNA SOLUZ.
- P.S. " DETERMINATO : $\exists$ UNA SOLUZ. UNICA DEL SIST. DI EQ. DI EQUILIBRIO
- P.S. " INDETERMINATO : $\exists$ INFINITE SOLUZIONI

RELAZIONE TRA P.S. E STRUTTURA

- STR ISOSTATICA $(g = v = s) \Rightarrow$ P.S. STAT. DETERMINATO
- STR. IPERSTATICA $(g = s < v) \Rightarrow$ P.S. STAT. INDETERMINATO

LES

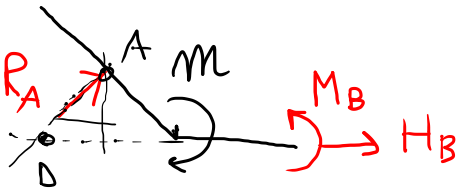


$g = 3$

$v = 3$

$s = 3$

STR ISOST.



$$\rightarrow: +\frac{R_A}{\sqrt{2}} + H_B = 0$$

$$+\uparrow: +\frac{R_A}{\sqrt{2}} = 0$$

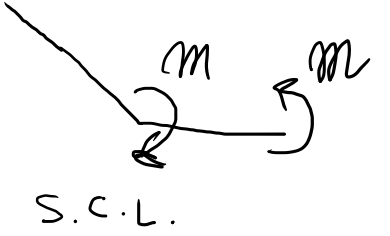
$$+\circlearrowleft A): -m + M_B + H_B \ell = 0$$

$H_B = 0$

$R_A = 0$

$M_B = m$

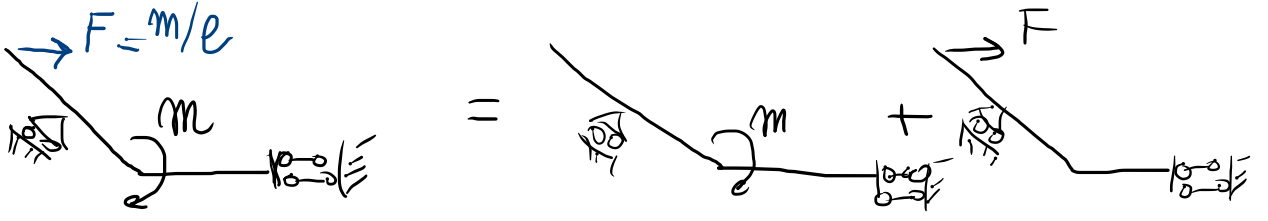
P. S, STAT-DETERM.



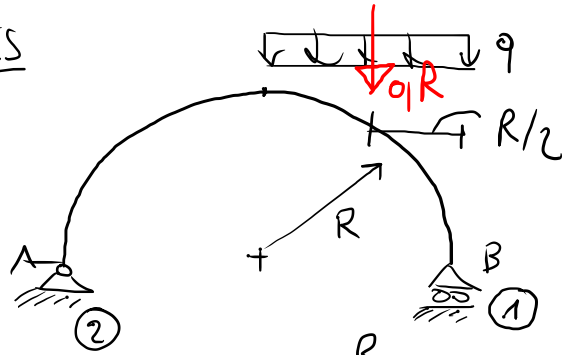
S.C.L.

(PROVARE A SOST. QUESTA EQ CON $+\circlearrowleft D$))

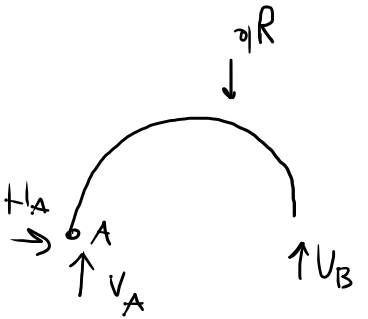
UNA VARIANTE:



ES



$g = v = 3 = 3$

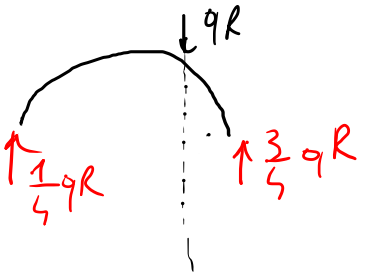


$\pm\rightarrow : \quad H_A = 0$

$\uparrow + : \quad V_A - qR + V_B = 0$

$+\circlearrowleft_A) : \quad -qR\,\frac{3}{2}R + V_B\,2R = 0$

S.C.L.



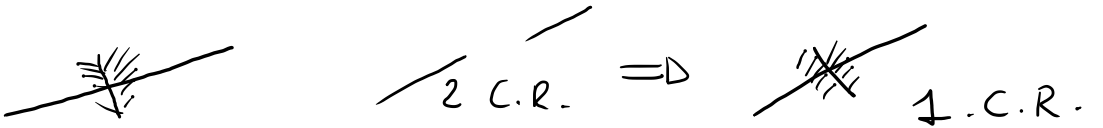
$H_A = 0$

$V_B = \frac{3}{2}qR^2\,\frac{1}{2R} = \frac{3}{4}qR$

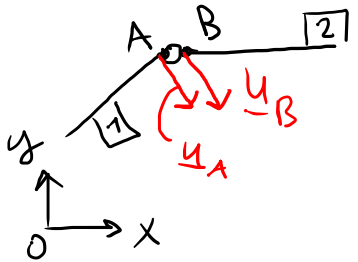
$V_A = qR - V_B = \frac{1}{4}qR$

VINCOLI INTERNI

$v=3$: VINCOLO TRIPLO (INCASTRO INTERNO) : È LA CONTINUITÀ MATERIALE TRA DUE SEZIONI UNA TRAVE



$v=2$: CERNIERA INTERNA



$\underline{u}_A = \underline{u}_B$

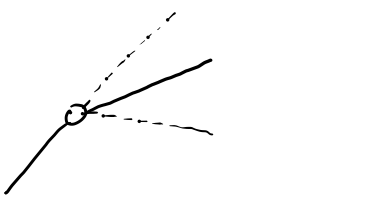
EQ. CINEMATICA (o DI VINCOLO)

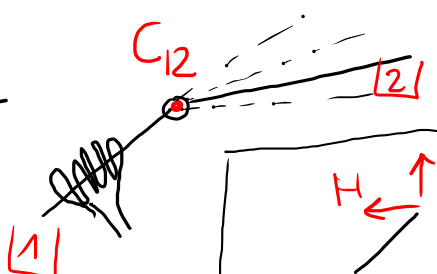
$$\begin{cases} u_{Ax} = u_{Bx} \\ u_{Ay} = u_{By} \end{cases}$$

C.I.R. RELATIVO C_{12}

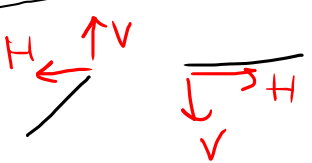
È IL PUNTO CERNIERA

$\theta_1 \neq \theta_2$



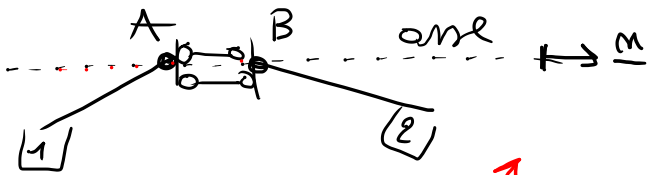


DAL PUNTO STATICO:



REAZ. INTERNE

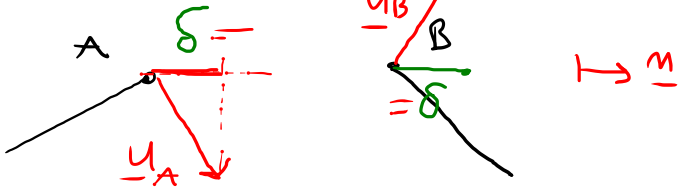
$\nu = 2$: DOPPIO - PENDOLO INTERNO



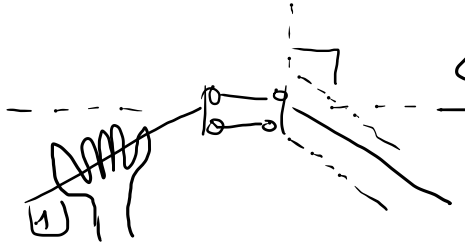
$\rightarrow \underline{M}$

$$\begin{cases} \underline{v}_A \cdot \underline{M} = \underline{v}_B \cdot \underline{M} \\ \vartheta_1 = \vartheta_2 \end{cases}$$

PRESTAZ. STATICA



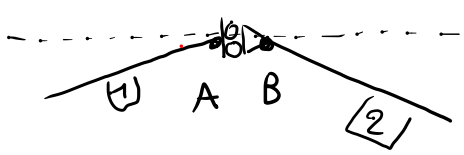
$\rightarrow \underline{M}$



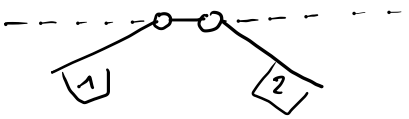
∞ C_{12}

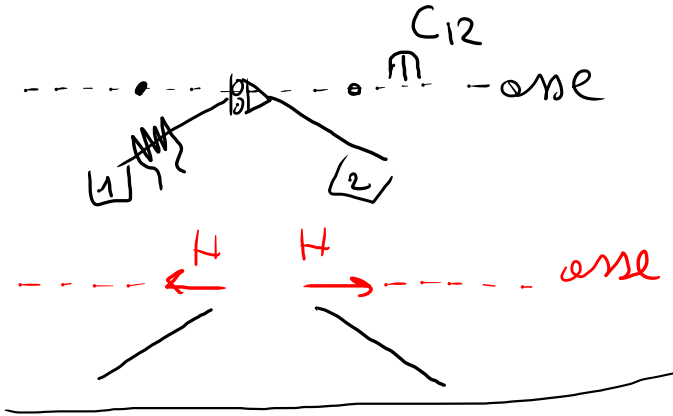
C.I.R. RELATIVO

$v=1$: CARRELLO INTERNO (PENDOLO / BIELLA INTERNO/A)



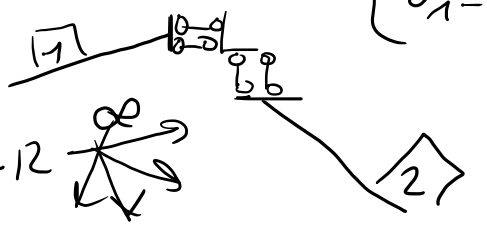
$$\begin{cases} \underline{u}_A \cdot \underline{M} = \underline{u}_B \cdot \underline{M} \end{cases}$$

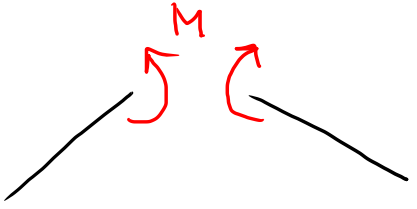




$v=1$: DOPPIO-DOPPIO PENDOLO INTERNO

$$\begin{cases} \vartheta_1 = \vartheta_2 \end{cases}$$



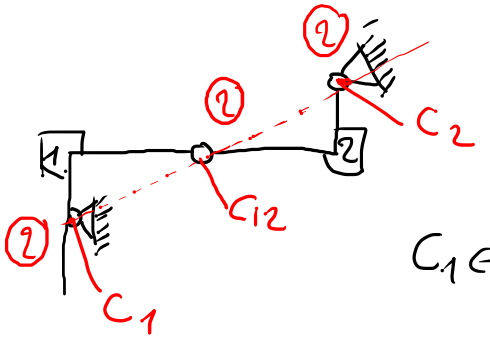


Lo studio della cinematica di 2 C.R. mutuamente vincolati coinvolge 3 CENTRI DI ROTAZIONE: i 2 CENTRI ASSOLUTI (C_1, C_2) e QUELLO RELATIVO (C_{12}).

PROPRIETA': Condiz. Necessaria affinché avvenga un moto relativo tra 2 C.R. è che i CENTRI C_1, C_2 siano allineati con C_{12}.

$$C_1 \leftrightarrow C_{12} \leftrightarrow C_2$$

ES. IL CASO DI 3 CERNIERE ALLINEATE



$g = 3 \cdot 2 = 6$

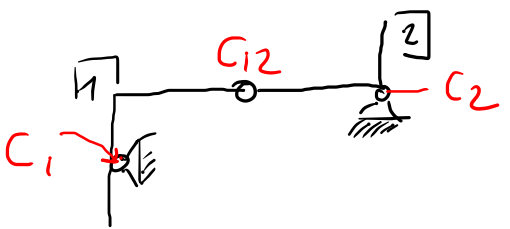
$v = 6$

$\boxed{s = 5}$

VINCOLI MAL DISPOSTI

$C_1 \leftrightarrow C_{12} \leftrightarrow C_2 \Rightarrow$ c'è moto relativo e lo STR. È LABILE ($s = 5$)

Prima valuto la possibilità di esistenza dei centri osservando i vincoli interni ed esterni. Poi verifico l'eventuale allineamento.



NON C'È L'ALLINEAMENTO

$\Rightarrow s = 6$ (VINCOLI BEN DISPOSTI)

STR ISOST.