

Carichi e deformazioni date hanno verso efficace in disegno. Determinare le reazioni vincolari a terra col PLV (Le=0). Determinare matrice di congruenza e di equilibrio. Determinare le azioni interne in A col PLV (Le=0).

Svolgere l'analisi cinematica.

Calcolare reazioni vincolari della struttura e delle aste.

Tracciare i diagrammi delle azioni interne nelle aste. @ Adolfo Zavelani Rossi, Politecnico di Milano



$V_A =$	
$V_F =$	

$$W_F = H_G =$$



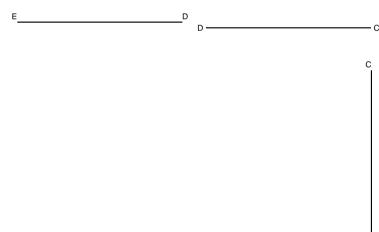
$$\begin{aligned} &\mathsf{H}_{\mathsf{DE}} = \\ &\mathsf{V}_{\mathsf{DE}} = \\ &\mathsf{W}_{\mathsf{DE}} = \\ &\mathsf{H}_{\mathsf{ED}} = \\ &\mathsf{V}_{\mathsf{ED}} = \\ &\mathsf{W}_{\mathsf{ED}} = \end{aligned}$$

$$H_{AC} = V_{AC} = V_{AC} = W_{AC} = H_{CA} = V_{CA} = W_{CA} = W$$

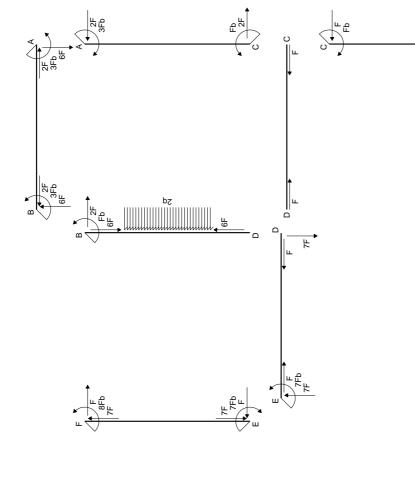
 $\begin{aligned} &H_{CG} = \\ &V_{CG} = \\ &W_{CG} = \\ &H_{GC} = \\ &V_{GC} = \\ &W_{GC} = \end{aligned}$ 

$$H_{BD} = V_{BD} = V_{BD} = V_{DB} = V$$

$$H_{FE} = V_{FE} = W_{FE} = H_{EF} = V_{EF} = W_{EF} = W$$



**EQUILIBRIO Nome:** 



# EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

 $H_G = -F + 2qb$ 

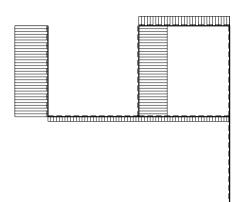
Traslazione verticale: aste CA CG AB BD  $V_A + V_{DB} = 0$ 

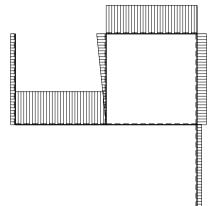
Rotazione intorno a C: aste CA CG AB BD  $H_Gb - V_{DB}b = -4W - qb^2$ 

Matrice di equilibrio 
$$\begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \quad \begin{bmatrix} F b & W & q b \\ -1 & 0 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 1 & -1 & 0 \end{bmatrix}$$

Soluzione del sistema 
$$\begin{bmatrix} Fb & W & qb^2 \end{bmatrix}$$
 
$$H_Gb \begin{bmatrix} -1 & 0 & 2 \\ 1 & -4 & -3 \end{bmatrix}$$
 
$$V_Ab \begin{bmatrix} -1 & 4 & -3 \\ -1 & 4 & 3 \end{bmatrix}$$

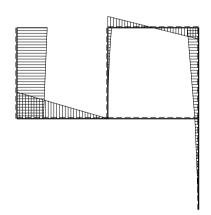












$$V_A = F - 4(W/b) - 3qb = -6F$$
  
 $V_E = 4(W/b) + 3qb = 7F$ 

$$H_{AB} = 2qb = 2F$$

$$V_{AB} = F - 4(W/b) - 3qb = -6F$$
  
 $W_{AB} = -Fb + 4qb^2 = 3Fb$ 

$$H_{BA} = -2qb = -2F$$

$$V_{BA} = -F + 4(W/b) + 3qb = 6F$$
  
 $W_{BA} = 4W - qb^2 = 3Fb$ 

$$H_{AC} = -2qb = -2F$$

$$V_{\Delta C} = 0$$

$$W_{AC} = Fb - 4qb^2 = -3Fb$$

$$H_{CA} = 2qb = 2F$$

$$V_{CA} = 0$$

$$W_{CA} = -Fb + 2qb^2 = Fb$$

$$H_{CG} = F - 2qb = -F$$

$$V_{CG} = 0$$

$$W_{CG} = Fb - 2qb^2 = -Fb$$

$$H_{GC} = -F + 2qb = F$$

$$V_{GC} = 0$$

$$W_{GC} = 0$$

$$W_F = Fb + 4W + 3qb^2 = 8Fb$$
  
 $H_C = -F + 2qb = F$ 

$$H_{CD} = -F = -F$$

$$V_{CD} = 0$$
 $W_{CD} = 0$ 
 $H_{DC} = F = F$ 

$$V_{DC} = 0$$
$$W_{DC} = 0$$

$$H_{BD} = 2qb = 2F$$

$$V_{BD} = F - 4(W/b) - 3qb = -6F$$
  
 $W_{BD} = qb^2 = Fb$ 

$$H_{DB} = 0$$

$$V_{DB} = -F + 4(W/b) + 3qb = 6F$$

$$W_{DB} = 0$$

$$V_{DF} = -4(W/b) - 3qb = -7F$$

$$W_{DE} = 0$$

$$H_{ED} = F = F$$

$$V_{ED} = 4(W/b) + 3qb = 7F$$

$$W_{ED} = 4W + 3qb^2 = 7Fb$$

$$H_{FF} = F = F$$

$$V_{FE} = 4(W/b) + 3qb = 7F$$

$$W_{FE} = Fb + 4W + 3qb^2 = 8Fb$$

$$H_{EF} = -F = -F$$

$$V_{EF} = -4(W/b) - 3qb = -7F$$

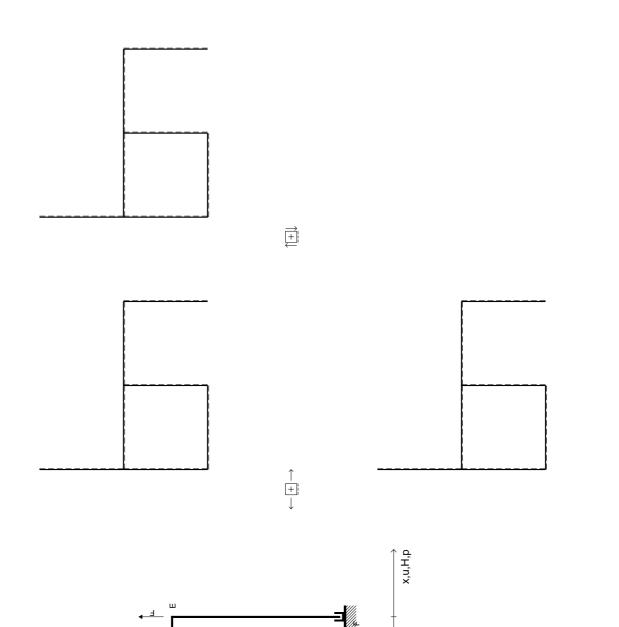
$$W_{EF} = -4W - 3qb^2 = -7Fb$$

CdSdC BG04 Isostatica Esempio 3

y,v,V,q ↔

Q

Ω



Svolgere l'analisi cinematica.

 $p_{BD} = -2q = -2F/b$ 

 $W_B = 4W = 4Fb$ 

 $V_E = F$ 

 $V_D = -F$ φ,W

Δ

Determinare matrice di congruenza e di equilibrio.

Determinare le reazioni vincolari a terra col PLV (Le=0).

Determinare le azioni interne in A col PLV (Le=0).

Carichi e deformazioni date hanno verso efficace in disegno.

Calcolare reazioni vincolari della struttura e delle aste.

Tracciare i diagrammi delle azioni interne nelle aste.

@ Adolfo Zavelani Rossi, Politecnico di Milano



$V_{A}$	=	
$H_{F}$	=	

$$W_F = H_G =$$

$$H_{AB} = V_{AB} = W_{AB} = H_{BA} = V_{BA} = V_{BA}$$

 $W_{BA} =$ 

$$H_{CD} = V_{CD} = V_{CD} = H_{DC} = V_{DC} = V_{DC}$$

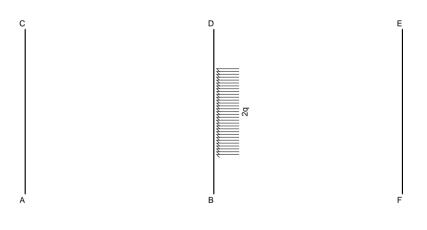
$$H_{DE} = V_{DE} = V_{DE} = W_{ED} = V_{ED} = W_{ED} = V_{ED} = V$$

$$H_{AC} = V_{AC} = W_{AC} = W_{AC} = U_{CA} = V_{CA} = U_{CA} = U$$

$$H_{BD} = V_{BD} = W_{BD} = H_{DB} = V_{DB} = V_{DB}$$

 $W_{DB} =$ 

$$H_{FE} = V_{FE} = W_{FE} = H_{EF} = V_{EF} = W_{FF} = W$$



H <sub>CG</sub> =
$V_{CG} =$
$W_{CG} =$
$H_{GC} =$
$V_{GC} =$
$W_{GC} =$

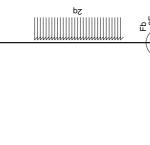
 $W_{CA} =$ 

G

**EQUILIBRIO Nome:** 







Soluzione del sistema



## EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

V<sub>A</sub> = 0

Traslazione verticale: aste CA CG AB BD

 $V_A + V_{DB} = 0$ Rotazione intorno a C: aste CA CG AB BD -H<sub>G</sub>b +V<sub>DB</sub>b = -4W +qb<sup>2</sup>

Matrice di equilibrio 
$$\begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \quad \begin{bmatrix} F b & W & q b \\ 0 & 0 & 0 \end{bmatrix}$$

$$V_F \quad \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -1 & 1 \end{bmatrix}$$

$$V_A = 0$$
  
 $H_F = -4(W/b) + 3qb = -F$ 

$$H_{AB} = 2qb = 2F$$

$$V_{AB} = 0$$

$$W_{AB} = -4W - qb^2 = -5Fb$$

$$V_{BA} = 0$$

$$W_{BA} = 4W + qb^2 = 5Fb$$

$$H_{AC} = -2qb = -2F$$

$$V_{AC} = 0$$

$$W_{AC} = 4W + qb^2 = 5F$$

$$H_{CA} = 2qb = 2F$$

$$V_{CA} = 0$$

$$W_{CA} = -4W + qb^2 = -3Fb$$

$$H_{CG} = -4(W/b) + qb = -3F$$

$$V_{CG} = 0$$

$$W_{CG} = 4W - qb^2 = 3Fb$$

$$H_{GC} = 4(W/b) - qb = 3F$$

$$V_{GC} = 0$$

$$W_{GC} = 0$$

$$V_{AB} = 0$$

$$H_{BA} = -2qb = -2F$$

$$V_{BA} = 0$$

$$V_{BA} = 4W + qb^2 = 5Fb$$

$$I_{AC} = -2qb = -2F$$

$$W_{AC} = 4W + qb^2 = 5Fb$$

$$H_{CA} = 2qb = 2F$$

$$V_{CA} = 0$$

$$N_{CA} = -4W + ab^2 = -3$$

$$H_{CG} = -4(W/b) + qb = -3F$$

$$\eta_{CG} = -4(VV/D) + 4D = -3F$$

$$W_{--} = 4W - ab^2 = 3Fb$$

$$H_{GC} = 4(W/b) - qb = 3F$$

$$V_{GC} = 0$$

$$I_A = 0$$

$$H_{BA} = -2qb = -2F$$

$$H_{BD} = 2qb = 2F$$

$$V_{BD} = 0$$

$$W_{BD} = -qb^2 = -Fb$$

$$H_{DB} = 0$$

$$V_{DB} = 0$$

$$W_{DB} = 0$$

$$W_F = -Fb + 4W - 3qb^2 = 0$$
  
 $H_C = 4(W/b) - qb = 3F$ 

$$H_{CD} = 4(W/b) - 3qb = F$$

$$V_{CD} = 0$$
$$W_{CD} = 0$$

$$H_{DC} = -4(W/b) + 3qb = -F$$

$$V_{DC} = 0$$

$$W_{DC} = 0$$

$$V_{ED} = F = F$$

$$W_{ED} = F = F$$

$$W_{ED} = -Fb = -Fb$$

 $V_{DF} = -F = -F$ 

 $W_{DF} = 0$ 

$$H_{FE} = -4(W/b) + 3qb = -F$$

$$V_{FF} = 0$$

$$W_{FE} = -Fb + 4W - 3qb^2 = 0$$

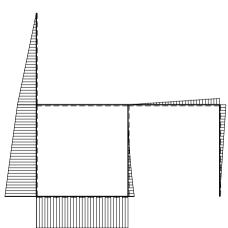
 $H_{DF} = 4(W/b) - 3qb = F$ 

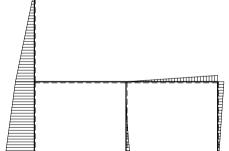
 $H_{ED} = -4(W/b) + 3qb = -F$ 

$$H_{EF} = 4(W/b) - 3qb = F$$

$$V_{EF} = 0$$

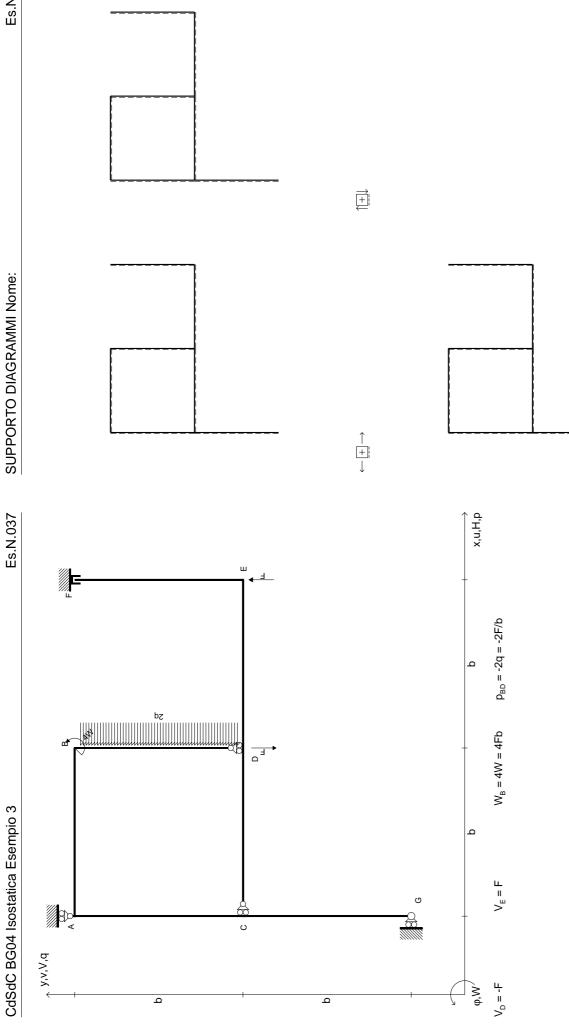
$$V_{EF} = 0$$
  
 $W_{FF} = Fb = Fb$ 





 $\uparrow \downarrow \downarrow$ 





Carichi e deformazioni date hanno verso efficace in disegno. Determinare le azioni interne in A col PLV (Le=0).

Calcolare reazioni vincolari della struttura e delle aste. Tracciare i diagrammi delle azioni interne nelle aste.

Determinare le reazioni vincolari a terra col PLV (Le=0).

Determinare matrice di congruenza e di equilibrio.

Svolgere l'analisi cinematica.

@ Adolfo Zavelani Rossi, Politecnico di Milano



$V_A$	=	
$H_{F}$	=	

$$W_F = H_G =$$

$$H_{AB} = V_{AB} = W_{AB} = H_{BA} = V_{BA} = V_{BA} = V_{BA}$$

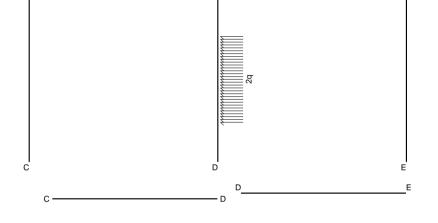
$$H_{CD} = V_{CD} = V_{CD} = H_{DC} = V_{DC} = V_{DC}$$

$$H_{DE} = V_{DE} = V_{DE} = W_{DE} = V_{ED} = V$$

$$H_{AC} = V_{AC} = V_{AC} = W_{AC} = H_{CA} = V_{CA} = W_{CA} = W$$

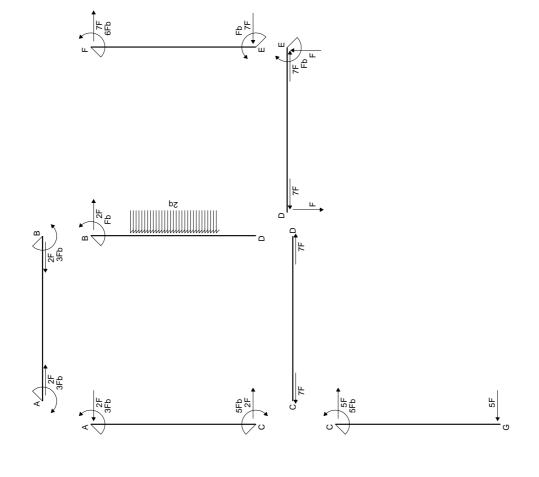
$$H_{BD} = V_{BD} = W_{BD} = H_{DB} = V_{DB} = W_{DB} = W$$

$$H_{FE} = V_{FE} = W_{FE} = H_{EF} = V_{EF} = W_{EF} = W$$



$$H_{CG} = V_{CG} = W_{CG} = H_{GC} = V_{GC} = W_{GC} = W$$

**EQUILIBRIO Nome:** 



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

V<sub>A</sub> = 0

Traslazione verticale: aste CA CG AB BD

 $V_A + V_{DB} = 0$ 

Rotazione intorno a C: aste CA CG AB BD  $H_Gb + V_{DB}b = -4W \cdot qb^2$ 

Soluzione del sistema

## REAZIONI

$$V_A = 0$$

$$H_F = 4(W/b) + 3qb = 7F$$

$$W_F = -Fb + 4W + 3qb^2 = 6Fb$$
  
 $H_G = -4(W/b) - qb = -5F$ 

 $H_{CD} = -4(W/b) - 3qb = -7F$ 

 $H_{DC} = 4(W/b) + 3qb = 7F$ 

$$H_{AB} = 2qb = 2F$$

$$V_{AB} = 0$$

$$W_{AB} = -4W + qb^2 = -3Fb$$

$$H_{BA} = -2qb = -2F$$

$$V_{BA} = 0$$

 $V_{AC} = 0$ 

 $V_{CA} = 0$ 

$$W_{BA} = 4W - qb^2 = 3Fb$$

 $W_{AC} = 4W - qb^2 = 3Fb$ 

 $W_{CA} = -4W - qb^2 = -5Fb$ 

 $H_{AC} = -2qb = -2F$ 

 $H_{CA} = 2qb = 2F$ 

$$H_{BD} = 2qb = 2F$$

 $V_{CD} = 0$ 

 $W_{CD} = 0$ 

 $V_{DC} = 0$ 

 $W_{DC} = 0$ 

$$V_{BD} = 0$$

$$W_{BD} = qb^2 = Fb$$

$$H_{DB} = 0$$

$$H_{DB} = 0$$

$$V_{DB} = 0$$

$$W_{DB} = 0$$

$$H_{DE} = -4(W/b) - 3qb = -7F$$

$$V_{DE} = -F = -F$$

$$W_{DF} = 0$$

$$H_{FD} = 4(W/b) + 3qb = 7F$$

$$V_{ED} = F = F$$

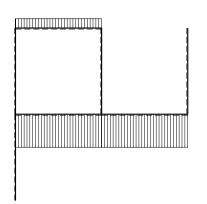
$$W_{ED} = -Fb = -Fb$$

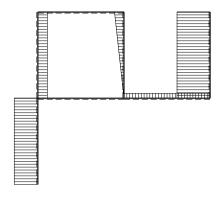
$$H_{FF} = 4(W/b) + 3qb = 7F$$

$$V_{FF} = 0$$

$$W_{FE} = -Fb + 4W + 3qb^2 = 6Fb$$
  
 $H_{FF} = -4(W/b) - 3qb = -7F$ 

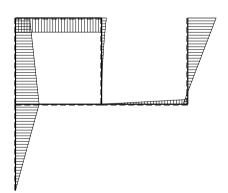
$$V_{EF} = 0$$
  
 $W_{FF} = Fb = Fb$ 











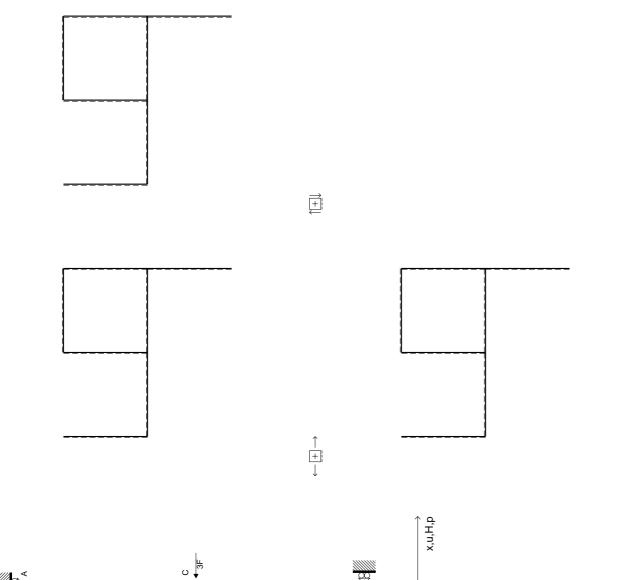
$H_{CG} = 4(W/b) + qb = 5F$
$V_{CG} = 0$
$W_{CG} = 4W + qb^2 = 5Fb$
$H_{GC} = -4(W/b) - qb = -5F$
$V_{GC} = 0$
$W_{GC} = 0$

CdSdC BG04 Isostatica Esempio 3

y,v,V,q ,

Q

Ω



 $q_{CD} = 3q = 3F/b$ 

 $W_E = -2W = -2Fb$ 

 $H_{\rm C} = -3F$ 

 $H_B = 2F$ φ,W

Δ

Determinare matrice di congruenza e di equilibrio. Svolgere l'analisi cinematica.

Determinare le reazioni vincolari a terra col PLV (Le=0).

Determinare le azioni interne in A col PLV (Le=0).

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$$V_A = H_F = 0$$

$$W_F = H_G =$$

$$H_{AB} = V_{AB} = V_{AB} = H_{BA} = V_{BA} = V$$

$$\begin{aligned} &H_{CD} = \\ &V_{CD} = \\ &W_{CD} = \\ &H_{DC} = \\ &V_{DC} = \\ &W_{DC} = \end{aligned}$$

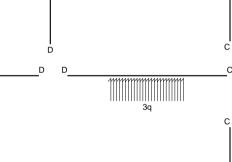
$$V_{DE} = W_{DE} = W_{ED} = V_{ED} = W_{ED} = W$$

 $H_{DE} =$ 

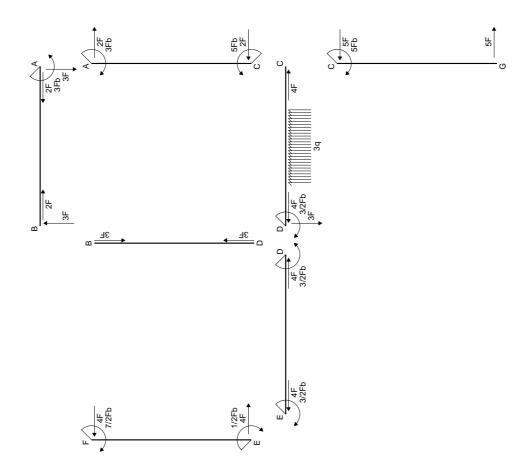
$$\begin{aligned} W_{BA} &= \\ H_{AC} &= \\ V_{AC} &= \\ W_{AC} &= \\ H_{CA} &= \\ V_{CA} &= \\ W_{CA} &= \end{aligned}$$

$$H_{BD} = V_{BD} = V_{BD} = V_{DB} = V$$

$$H_{FE} = V_{FE} = W_{FE} = H_{EF} = V_{EF} = W_{EF} = W$$



**EQUILIBRIO Nome:** 



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

 $V_A = -3qb$ 

Traslazione verticale: aste CA CG AB BD

 $V_A + V_{DB} = 0$ Rotazione intorno a C: aste CA CG AB BD  $H_Gb - V_{DB}b = 2Fb$ 

Soluzione del sistema 
$$\begin{bmatrix} V_A b \\ V_D b \end{bmatrix} \begin{bmatrix} 0 & 0 & -3 \\ 0 & 0 & 3 \end{bmatrix}$$

$$V_A = -3qb = -3F$$

$$V_{AB} = -3qb = -3F$$

$$H_{BA} = 2F = 2F$$

$$V_{BA} = 3qb = 3F$$

$$W_{BA} = 0$$

$$H_{AC} = 2F = 2F$$

$$V_{AC} = 0$$

$$W_{AC} = -3qb^2 = -3Fb$$

$$H_{CA} = -2F = -2F$$

$$V_{CA} = 0$$

$$W_{CA} = 2Fb + 3qb^2 = 5Fb$$

$$H_{CG} = -2F - 3qb = -5F$$

$$V_{CG} = 0$$

$$W_{CG} = -2Fb - 3qb^2 = -5Fl$$

$$H_{GC} = 2F + 3qb = 5F$$

$$V_{GC} = 0$$

$$W_{GC} = 0$$

$$V_A = -3qb = -3F$$
  
 $H_E = -F - 3qb = -4F$ 

$$H_{AB} = -2F = -2F$$

$$N_{AB} = 3qb^2 = 3Ft$$

$$W_{-} = 0$$

$$H_{CA} = -2F = -2F$$

$$H_{cc} = -2F - 3qb = -5I$$

$$H_{CG} = -2F - 3qb = -5F$$

$$H_{GC} = 2F + 3qb = 5F$$

$$V_{GC} = 0$$

## REAZIONI

$$V_A = -3qb = -3F$$

$$V_{AB} = -3qb = -3F$$

$$W_{AB} = 3qb^2 = 3Fb$$

$$H_{BA} = 2F = 2F$$

$$H_{AC} = 2F = 2F$$

$$V_{AC} = 0$$

$$N_{AC} = -3qb^2 = -3Fb$$

$$H_{CA} = -2F = -2F$$

$$V_{CA} = 0$$

$$N_{cA} = 0$$
  
 $N_{cA} = 2$ Fb +3ab<sup>2</sup> = 5F

$$H_{cc} = -2F - 3ab = -5F$$

$$H_{CG} = -2F - 3qb = -5F$$

$$W_{CG} = -2Fb - 3qb^2 = -5Fb$$

$$W_{GC} = 0$$

$$W_F = -Fb + 2W - 9/2qb^2 = -7/2Fb$$

$$H_{c} = 2F + 3qb = 5F$$

$$H_{CD} = F + 3qb = 4F$$

$$V_{CD} = 0$$

 $H_{BD} = 0$ 

 $W_{BD} = 0$ 

 $H_{DB} = 0$ 

 $W_{DB} = 0$ 

$$W_{CD} = 0$$

$$H_{DC} = -F - 3qb = -4F$$

 $V_{BD} = -3qb = -3F$ 

 $V_{DB} = 3qb = 3F$ 

$$V_{DC} = -3qb = -3F$$

$$W_{DC} = -3/2qb^2 = -3/2Fb$$

$$H_{FF} = -F - 3qb = -4F$$

 $H_{DF} = F + 3qb = 4F$ 

 $W_{DF} = 3/2qb^2 = 3/2Fb$ 

 $W_{ED} = -3/2qb^2 = -3/2Fb$ 

 $H_{ED} = -F - 3qb = -4F$ 

 $V_{DF} = 0$ 

 $V_{ED}^{--} = 0$ 

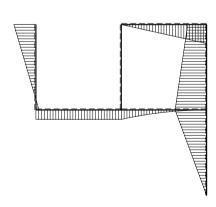
$$V_{FE} = 0$$

$$W_{FF} = -Fb + 2W - 9/2qb^2 = -7/2Fb$$

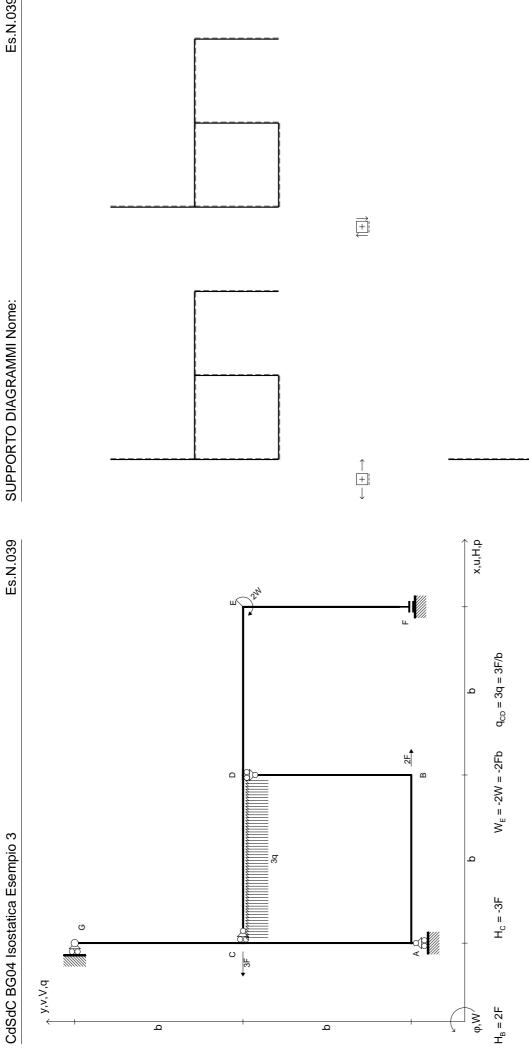
$$H_{FF} = F + 3qb = 4F$$

$$V_{FF} = 0$$

$$W_{FF} = -2W + 3/2qb^2 = -1/2Fb$$







Carichi e deformazioni date hanno verso efficace in disegno.

Calcolare reazioni vincolari della struttura e delle aste. Tracciare i diagrammi delle azioni interne nelle aste.

@ Adolfo Zavelani Rossi, Politecnico di Milano

Determinare le reazioni vincolari a terra col PLV (Le=0).

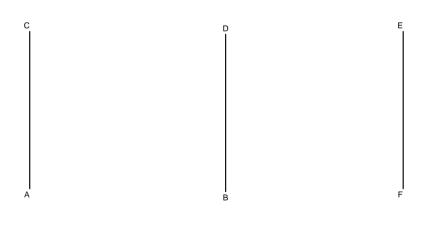
Determinare le azioni interne in A col PLV (Le=0).

Determinare matrice di congruenza e di equilibrio.

Svolgere l'analisi cinematica.



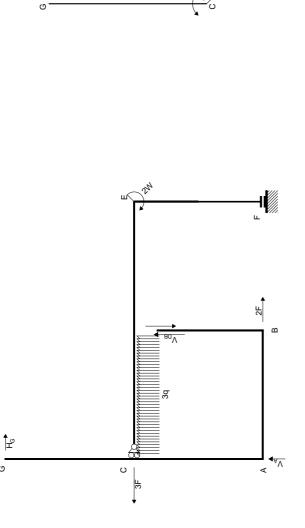




REAZIONI	
$V_A =$	V
V <sub>F</sub> =	H
H <sub>AB</sub> =	
$V_{AB} =$	
W <sub>AB</sub> =	
H <sub>BA</sub> =	
$V_{BA} =$	
W <sub>BA</sub> =	
H <sub>DE</sub> =	
V <sub>DE</sub> =	
$W_{DE} =$	
H <sub>ED</sub> =	
V <sub>ED</sub> =	
W <sub>ED</sub> =	
H <sub>BD</sub> =	
V <sub>BD</sub> =	
$W_{BD} =$	
H <sub>DB</sub> =	
V <sub>DB</sub> =	
W <sub>DB</sub> =	
H <sub>CG</sub> =	
V <sub>CG</sub> =	
W <sub>CG</sub> =	
cg ⊔ _	

REAZIONI V <sub>A</sub> = V <sub>F</sub> =	$W_F = H_G =$	
$H_{AB} = W_{AB} = W_{AB} = W_{AB} = H_{BA} = W_{BA} = W$		$H_{CD} = V_{CD} = V_{CD} = W_{CD} = H_{DC} = V_{DC} = W_{DC} = V_{DC} = V$
$H_{DE} = V_{DE} = V_{DE} = V_{DE} = V_{ED} = V$		$H_{AC} = V_{AC} = V_{AC} = W_{AC} = U_{CA} = V_{CA} = V_{CA} = U_{CA} = U$
$H_{BD} = V_{BD} = V_{BD} = V_{DB} = V$		$H_{FE} = V_{FE} = V_{FE} = H_{EF} = V_{EF} = W_{EF} = W$
$H_{CG} = V_{CG} = V_{CG} = V_{CG} = V_{GC} = V$		

**EQUILIBRIO Nome:** 



## EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

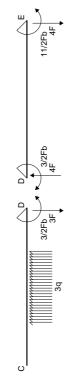
H<sub>G</sub> = F

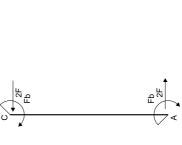
Traslazione verticale: aste CA CG AB BD

 $V_{A}$  + $V_{DB}$  = 0 Rotazione intorno a C: aste CA CG AB BD - $H_{G}$ b + $V_{DB}$ b = -2Fb

Matrice di equilibrio 
$$\begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix} \quad \begin{bmatrix} Fb & W & qb \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ -2 & 0 & 0 \end{bmatrix}$$

Soluzione del sistema 
$$\begin{bmatrix} Fb & W & qb^2 \end{bmatrix}$$
 
$$\begin{bmatrix} H_Gb \\ V_Ab \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$









## REAZIONI

$$V_A = F = F$$

$$H_{AB} = -2F = -2F$$

$$H_{BA} = 2F = 2F$$

$$V_{BA} = -F = -F$$

$$W_{BA} = 0$$

$$H_{DF} = 0$$

$$V_{DE} = F + 3qb = 4F$$

$$W_{DE} = -3/2qb^2 = -3/2Fb$$

$$H_{ED} = 0$$

$$V_{FD} = -F - 3qb = -4F$$

$$W_{ED} = Fb + 9/2qb^2 = 11/2Fb$$

$$H_{BD} = 0$$

$$V_{BD} = F = F$$

$$W_{BD} = 0$$

$$H_{DB} = 0$$

$$V_{DB} = -F = -F$$

$$W_{DB} = 0$$

$$H_{CG} = -F = -F$$

$$V_{CG} = 0$$

$$W_{CG} = Fb = Fb$$

$$H_{GC} = F = F$$

$$V_{GC} = 0$$

$$W_{GC} = 0$$

$$V_{E} = -F - 3qb = -4F$$

$$V_{AB} = F = F$$

$$W_{AB} = Fb = Fb$$

$$H_{BA} = 2F = 2$$

$$H_{DE} = 0$$

$$N_{\rm BE} = -3/2 \, \text{gb}^2 = -3/2 \, \text{Fb}$$

$$V_{FD} = -F - 3ab = -4F$$

$$W_{cp} = Fb + 9/2ab^2 = 11/2Fl$$

$$V_{BD} = F =$$

$$W_{BD} = 0$$

$$N_{DB} = 0$$

$$V_{CG} = 0$$

$$W_{GC} = 0$$

$$W_F = Fb + 2W + 9/2qb^2 = 15/2Fb$$

$$H_G = F = F$$

$$H_{CD} = 0$$

$$V_{CD} = 0$$

$$W_{CD} = 0$$

$$H_{DC} = 0$$

$$V_{DC} = -3qb = -3F$$

$$W_{DC} = 3/2qb^2 = 3/2Fb$$

$$H_{AC} = 2F = 2F$$

$$V_{AC} = 0$$

$$W_{AC} = -Fb = -Fb$$

$$H_{CA} = -2F = -2F$$

$$V_{CA} = 0$$

$$W_{CA} = -Fb = -Fb$$

$$H_{FE} = 0$$

$$V_{FF} = -F - 3qb = -4F$$

$$W_{FF} = Fb + 2W + 9/2qb^2 = 15/2Fb$$

$$H_{cc} = 0$$

$$V_{FF} = F + 3qb = 4F$$

$$W_{FF} = -Fb - 2W - 9/2qb^2 = -15/2Fb$$



← + → ⊢ → 5 F

CdSdC BG04 Isostatica Esempio 3

y,v,V,q <sub>↑</sub>

2F

O

Ω

Q

Svolgere l'analisi cinematica.

 $W_E = -2W = -2Fb$ 

 $H_{\rm C} = -3F$ 

 $H_B = 2F$ φ,W

Δ

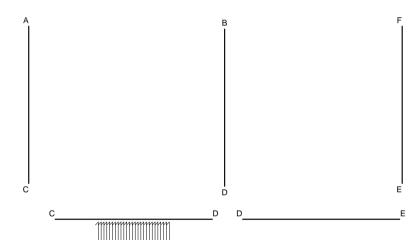
Determinare matrice di congruenza e di equilibrio.

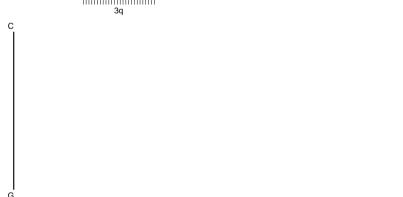
Determinare le reazioni vincolari a terra col PLV (Le=0). Determinare le azioni interne in A col PLV (Le=0).

Carichi e deformazioni date hanno verso efficace in disegno.

Calcolare reazioni vincolari della struttura e delle aste. Tracciare i diagrammi delle azioni interne nelle aste.







## REAZIONI

$V_A =$	W <sub>F</sub> =
V <sub>F</sub> =	H <sub>G</sub> =

1 <sub>AB</sub> =			
/ <sub>AB</sub> =			
$V_{AB} =$			
H <sub>BA</sub> =			
/ <sub>BA</sub> =			
$V_{BA} =$			
H <sub>DE</sub> =			

DA	
$H_{DE} = V_{DE} = W_{DE} = H_{ED} = V_{ED} = W_{ED} = W$	
H <sub>BD</sub> =	

$H_{BD} =$	
$V_{BD} =$	
$W_{BD} =$	
$H_{DB} =$	
$V_{DB} =$	
$W_{DB} =$	
$H_{CG} =$	

$$V_{CG} = W_{CG} = W_{GC} = V_{GC} = V_{GC} = W_{GC} = W$$

$$H_{CD} = V_{CD} = V_{CD} = H_{DC} = V_{DC} = V$$

$$W_{DC} =$$

$$H_{AC} =$$

$$V_{AC} =$$

$$W_{AC} =$$

$$H_{CA} =$$

$$V_{CA} =$$

$$W_{CA} =$$

$$H_{FF} =$$

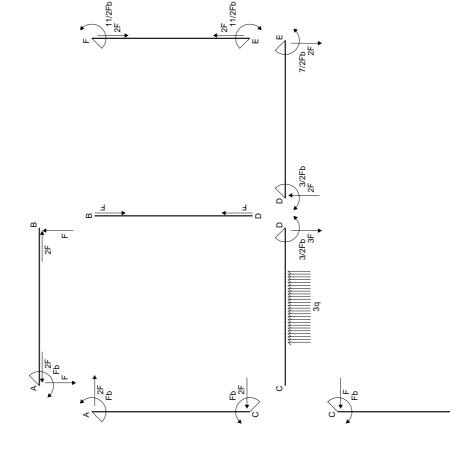
$$H_{FE} = V_{FE} = W_{FE} = H_{EF} = V_{EF} = W_{EF} = W$$

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**EQUILIBRIO Nome:** 

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EQUAZIONI DI EQUILIBRIO

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Traslazione orizzontale globale

Traslazione verticale: aste CA CG AB BD

Rotazione intorno a C: aste CA CG AB BD  $H_Gb + V_{DB}b = 2Fb$  $V_A + V_{DB} = 0$ 

Matrice di equilibrio  $\begin{bmatrix} V_A b & H_G b & V_{DB} b \end{bmatrix}$  u<sub>F</sub>  $\begin{bmatrix} 0 & 1 & 0 \end{bmatrix}$ 

Soluzione del sistema

## REAZIONI

$$V_A = -F = -F$$
  
 $V_F = F - 3qb = -2F$ 

$$W_F = -Fb + 2W + 9/2qb^2 = 11/2Fb$$

$$H_G = F = F$$

$$\mathsf{H}_{\mathsf{AB}} = \mathsf{-2F} = \mathsf{-2F}$$

$$V_{AB} = -F = -F$$

$$W_{AB} = -Fb = -Fb$$

$$H_{BA} = 2F = 2F$$

$$V_{BA} = F = F$$

$$W_{BA} = 0$$

$$H_{DE} = 0$$

$$V_{DE} = -F + 3qb = 2F$$

$$W_{DE} = -3/2qb^2 = -3/2Fb$$

$$H_{FD} = 0$$

$$V_{ED} = F - 3qb = -2F$$

$$W_{ED} = -Fb + 9/2qb^2 = 7/2Fb$$

$$H_{BD} = 0$$

$$V_{BD} = -F = -F$$

$$W_{BD} = 0$$

$$H_{DB} = 0$$

$$V_{DB} = F = F$$

$$W_{DB} = 0$$

$$H_{CG} = -F = -F$$

$$V_{CG} = 0$$

$$W_{CG} = -Fb = -Fb$$

$$H_{GC} = F = F$$

$$V_{GC} = 0$$

$$W_{GC} = 0$$

$$H_{CD} = 0$$
  
 $V_{CD} = 0$   
 $W_{CD} = 0$   
 $H_{DC} = 0$   
 $V_{DC} = -3qb = -3F$   
 $W_{DC} = 3/2qb^2 = 3/2Fb$ 

$$H_{AC} = 2F = 2F$$

$$V_{\Delta C} = 0$$

$$W_{AC} = Fb = Fb$$

$$H_{CA} = -2F = -2F$$

$$V_{CA} = 0$$

$$W_{CA} = Fb = Fb$$

$$H_{FF} = 0$$

$$V_{FF} = F - 3qb = -2F$$

$$W_{FF} = -Fb + 2W + 9/2qb^2 = 11/2Fb$$

$$H_{cc} = 0$$

$$V_{FF} = -F + 3qb = 2F$$

$$W_{EF} = Fb - 2W - 9/2qb^2 = -11/2Fb$$

