CdSdC BG04 Isostatica Esempio 4

y,v,V,q ,

Δ

Ω

Q

Svolgere l'analisi cinematica.

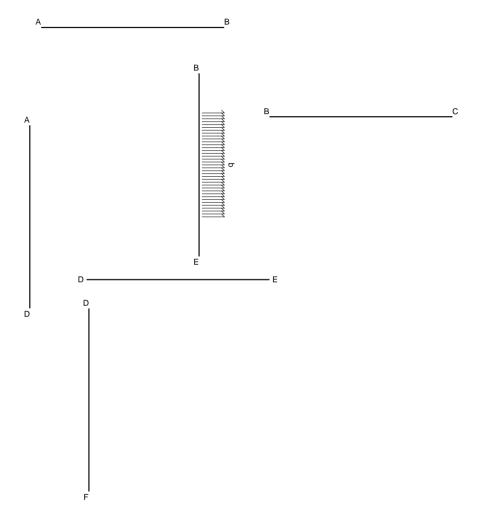
H_A = 4F φ,W

Determinare matrice di congruenza e di equilibrio.

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

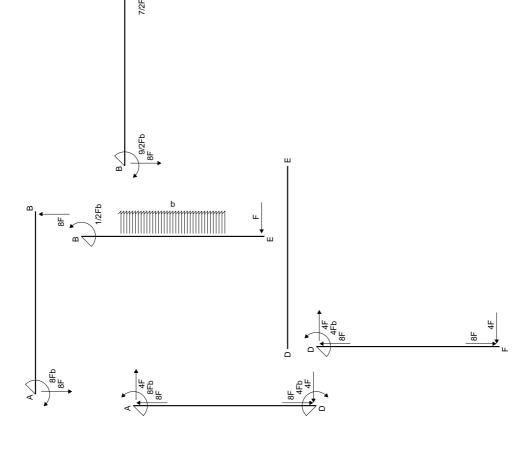
Carichi e deformazioni date hanno verso efficace in disegno. Calcolare reazioni vincolari della struttura e delle aste.

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



REAZIONI $V_C = W_C =$	H _F = V _F =
$H_{AB} = V_{AB} = W_{AB} = W_{BA} = V_{BA} = W_{BA} = W$	$H_{BC} = V_{BC} = V_{BC} = W_{BC} = H_{CB} = V_{CB} = W_{CB} = W$
$H_{DE} = V_{DE} = V_{DE} = W_{DE} = H_{ED} = V_{ED} = W_{ED} = W$	$H_{AD} = V_{AD} = V_{AD} = H_{DA} = V_{DA} = V$
$\begin{aligned} H_{DF} &= \\ V_{DF} &= \\ W_{DF} &= \\ H_{FD} &= \\ V_{FD} &= \\ W_{FD} &= \end{aligned}$	$H_{BE} = V_{BE} = W_{BE} = H_{EB} = V_{EB} = W_{EB} = W$

EQUILIBRIO Nome:



EQUAZIONI DI EQUILIBRIO

 $2V_{c}b + W_{c} = 7Fb + 4W + 3/2qb^{2}$ Rotazione globale intorno a F

Traslazione verticale: aste DE EB BC

 $V_{\rm c}$ - $V_{\rm BA}$ = 0 Rotazione intorno a D: aste DE EB BC $2V_{\rm c}b$ + $W_{\rm c}$ - $V_{\rm BA}b$ = 4W +1/2qb²

Matrice di equilibrio
$$\begin{bmatrix} V_{c}b & W_{c} & V_{BA}b \end{bmatrix} \quad \begin{bmatrix} Fb & W & qb^{2} \\ 7 & 4 & 3/2 \end{bmatrix}$$

$$\psi_{b} \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 7 & 4 & 3/2 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\psi_{DE} \begin{bmatrix} 2 & 1 & -1 \\ 2 & 1 & -1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 4 & 1/2 \end{bmatrix}$$

Soluzione del sistema

REAZIONI

$$V_C = 7F + qb = 8F$$

 $W_C = -7Fb + 4W - 1/2qb^2 = -7/2Fb$

$$H_F = -3F - qb = -4F$$

 $V_F = -7F - qb = -8F$

 $H_{BC} = 0$

 $H_{CR} = 0$

$$H_{AB} = 0$$

$$V_{AB} = -7F - qb = -8F$$

 $W_{AB} = -7Fb - qb^2 = -8Fb$

$$V_{BC} = -7F - qb = -8F$$

 $W_{BC} = -4W - 1/2qb^2 = -9/2Fb$

$$H_{BA} = 0$$

$$V_{BA} = 7F + qb = 8F$$

$$V_{CB} = 7F + qb = 8F$$

 $W_{CB} = -7Fb + 4W - 1/2qb^2 = -7/2Fb$

$$W_{BA} = 0$$

$$H_{DE} = F - qb = 0$$

$$V_{DE} = 0$$

$$W_{DE} = 0$$

$$H = -E + ab$$

$$\mathsf{H}_{\mathsf{ED}} = \mathsf{-F} \; \mathsf{+qb} = 0$$

$$V_{ED} = 0$$
$$W_{ED} = 0$$

$$H_{DA} = -4F = -4F$$

$$V_{DA} = -7F - qb = -8$$

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

$$V_{DF} = 7F + qb = 8F$$

$$W_{DF} = 3Fb + qb^2 = 4Fb$$

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

$$V_{FD} = -7F - qb = -8F$$

$$W_{FD} = 0$$

⊢ 10 F

$$H_{AD} = 4F = 4F$$

$$V_{AD} = 7F + qb = 8F$$

$$W_{AD} = 7Fb + qb^2 = 8Fb$$

$$V_{DA} = -7F - qb = -8F$$

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

$$H_{BE} = 0$$

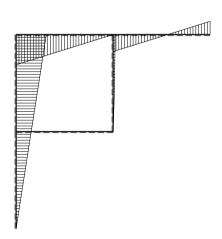
$$V_{BE} = 0$$

$$W_{BE} = 1/2qb^2 = 1/2Fb$$

$$H_{EB} = -qb = -F$$

$$V_{FB} = 0$$

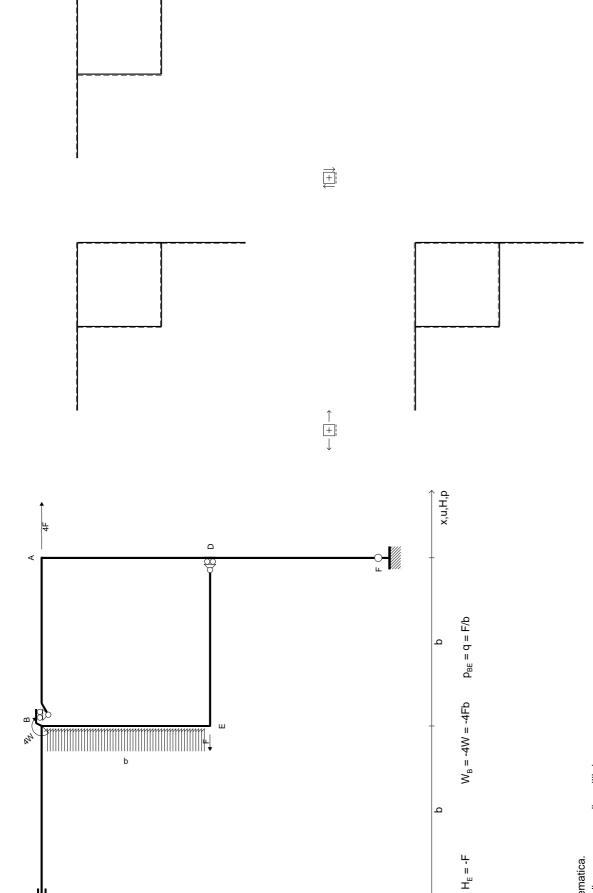
$$W_{FB} = 0$$



CdSdC BG04 Isostatica Esempio 4

y,v,V,q

Р



Ω

Svolgere l'analisi cinematica.

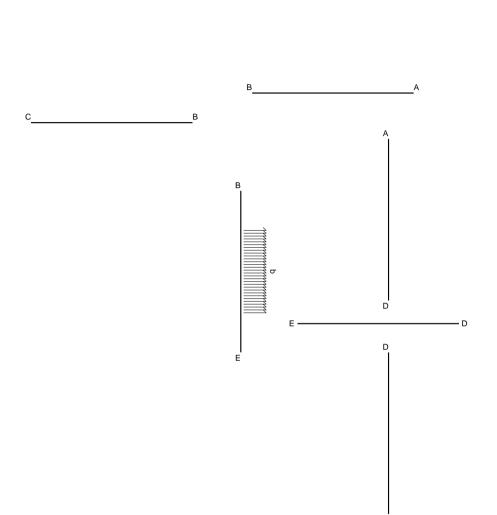
H_A = 4F φ,W

Determinare matrice di congruenza e di equilibrio.

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

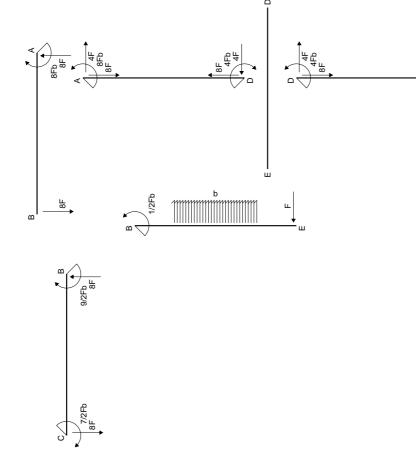
Carichi e deformazioni date hanno verso efficace in disegno.

Calcolare reazioni vincolari della struttura e delle aste. Tracciare i diagrammi delle azioni interne nelle aste. Adolfo Zavelani Rossi, Politecnico di Milano



REAZIONI	
V _C =	$H_F =$
W _C =	V _F =
·	•
H _{AB} =	$H_{BC} =$
$V_{AB} =$	$V_{BC} =$
$W_{AB} =$	$W_{BC} =$
H _{BA} =	H _{CB} =
V _{BA} =	V _{CB} =
W _{BA} =	W _{CB} =
5.	0.5
H _{DE} =	$H_{AD} =$
$V_{DE} =$	$V_{AD} =$
$W_{DE} =$	$W_{AD} =$
$H_{ED} =$	$H_{DA} =$
$V_{ED} =$	$V_{DA} =$
W _{ED} =	$W_{DA} =$
H _{DF} =	$H_{BE} =$
$V_{DF} =$	$V_{BE} =$
$W_{DF} =$	$W_{BE} =$
$H_{FD} =$	$H_{EB} =$
$V_{FD} =$	$V_{EB} =$
$W_{FD} =$	$W_{EB} =$

EQUILIBRIO Nome:



EQUAZIONI DI EQUILIBRIO

Rotazione globale intorno a F

 $-2V_{c}b + W_{c} = 7Fb + 4W + 3/2qb^{2}$

Traslazione verticale: aste DE EB BC

Rotazione intorno a D: aste DE EB BC - $2V_cb + W_c + V_{BA}b = 4W + 1/2qb^2$ $V_{c} - V_{BA} = 0$

Soluzione del sistema



$$V_C = -7F - qb = -8F$$

 $W_C = -7Fb + 4W - 1/2qb^2 = -7/2Fb$

$$H_F = -3F - qb = -4F$$

 $V_F = 7F + qb = 8F$

$$H_{AB} = 0$$

$$V_{AB} = 7F + qb = 8F$$

 $W_{AB} = -7Fb - qb^2 = -8Fb$

$$V_{BC} = 7F + qb = 8F$$

 $W_{BC} = -4W - 1/2qb^2 = -9/2Fb$

$$H_{BA} = 0$$

 $V_{BA} = -7F - qb = -8F$

$$H_{CB} = 0$$

 $V_{--} = -7$

$$W_{BA} = 0$$

$$V_{CB} = -7F - qb = -8F$$

 $W_{CB} = -7Fb + 4W - 1/2qb^2 = -7/2Fb$

$$H_{\Delta D} = 4F = 4F$$

 $H_{BC} = 0$

$$H_{DE} = F - qb = 0$$
$$V_{DE} = 0$$

$$V_{AD} = -7F - qb = -8F$$

$$V_{DE} = 0$$

$$W_{AD} = 7Fb + qb^2 = 8Fb$$

$$W_{DE} = 0$$

$$H_{DA} = -4F = -4F$$

$$H_{ED} = -F + qb = 0$$

$$V_{ED} = 0$$

$$V_{DA} = 7F + qb = 8F$$

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

$$W_{ED} = 0$$

 $H_{BF} = 0$

 $V_{RF} = 0$

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

$$V_{DF} = -7F - qb = -8F$$

$$W_{DF} = 3Fb + qb^2 = 4Fb$$

$$W_{BE} = 1/2qb^2 = 1/2Fb$$

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

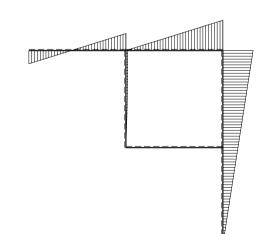
$$H_{EB} = -qb = -F$$

$$V_{FD} = 7F + qb = 8F$$

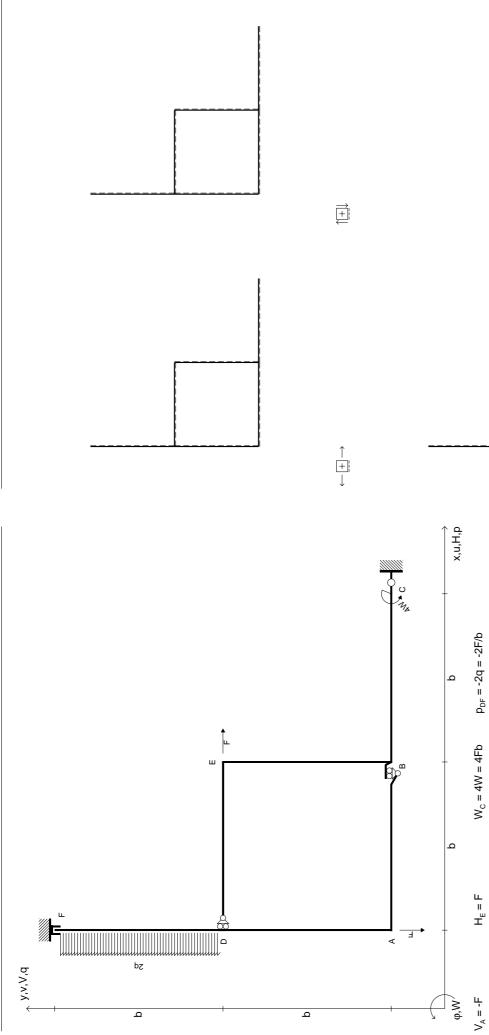
$$V_{EB} = QS = 0$$

$$W_{FD} = 0$$

$$V_{EB} = 0$$
 $W_{FB} = 0$



CdSdC BG04 Isostatica Esempio 4



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 B col PLV (Le=0).

Determinare matrice di congruenza e di equilibrio.

Svolgere l'analisi cinematica.

@ Adolfo Zavelani Rossi, Politecnico di Milano

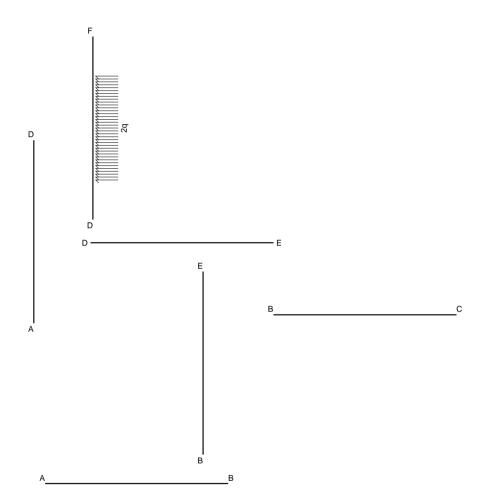
 $W_{EB} =$



H _C =	H _F =
V _C =	$W_F =$

H _{AB} =	H _{BC} =	$H_{DE} =$
$V_{AB} =$	V _{BC} =	$V_{DE} =$
$W_{AB} =$	$W_{BC} =$	$W_{DE} =$
H _{BA} =	H _{CB} =	$H_{ED} =$
$V_{BA} =$	V _{CB} =	$V_{ED} =$
$W_{BA} =$	W _{CB} =	$W_{ED} =$

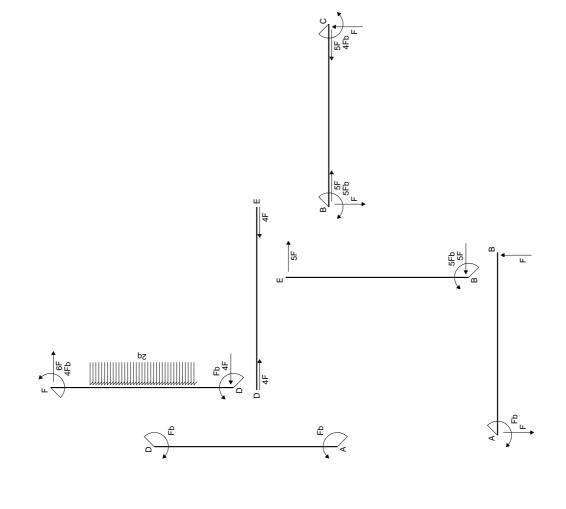
$H_{AD} =$	H _{DF} =	H_{BE}
/ _{AD} =	$V_{DF} =$	V_{BE}
$N_{AD} =$	$W_{DF} =$	W_{BE}
$H_{DA} =$	H _{FD} =	H _{EB}
/ _{DA} =	$V_{FD} =$	$V_{\sf EB}$
$N_{DA} =$	$W_{FD} =$	W_{EE}



EQUILIBRIO Nome:

ш

ρZ



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale $V_{\rm C} = F$

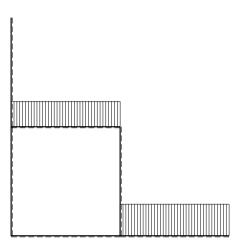
Traslazione verticale: aste DE EB BC

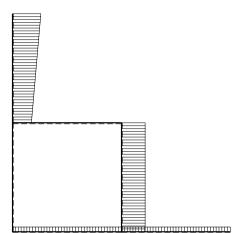
 V_{c} - V_{BA} = 0 Rotazione intorno a D: aste DE EB BC $H_{c}b$ +2 $V_{c}b$ - $V_{BA}b$ = -4W

Soluzione del sistema

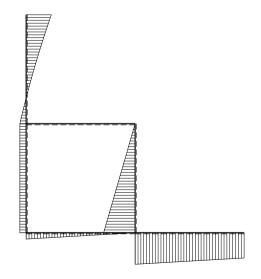
Matrice di equilibrio $\begin{bmatrix} H_{C}b & V_{C}b & V_{BA}b \end{bmatrix}$ $V_{D} \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & -1 \end{bmatrix} =$

REAZIONI







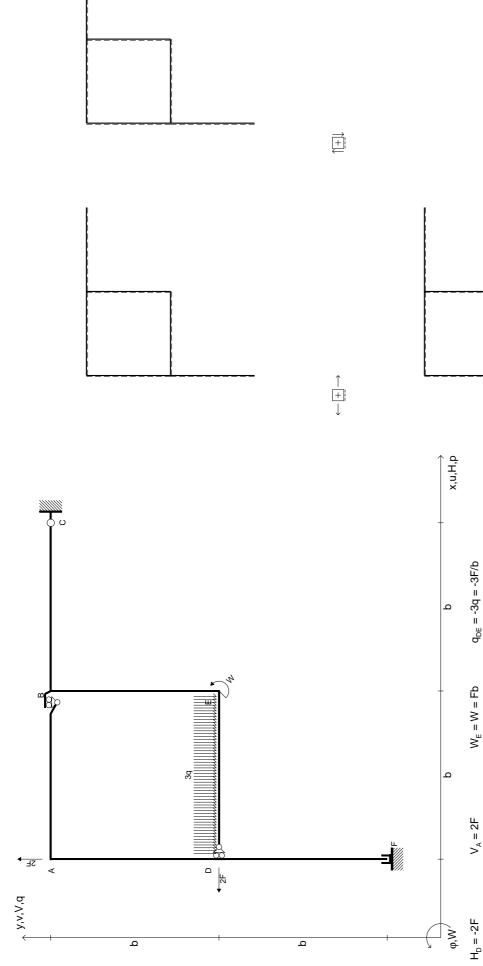


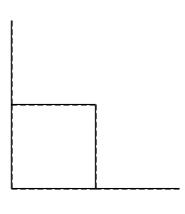


$H_{C} = -F - 4(W/b) = -5F$ $V_{C} = F = F$	$H_F = 4(W/b) + 2qb = 6F$ $W_F = -Fb + 4W + qb^2 = 4Fb$	
$H_{AB} = 0$ $V_{AB} = -F = -F$ $W_{AB} = -Fb = -Fb$ $H_{BA} = 0$ $V_{BA} = F = F$ $W_{BA} = 0$	$H_{BC} = F + 4(W/b) = 5F$ $V_{BC} = -F = -F$ $W_{BC} = -Fb - 4W = -5Fb$ $H_{CB} = -F - 4(W/b) = -5F$ $V_{CB} = F = F$ $W_{CB} = 4W = 4Fb$	$H_{DE} = 4(W/b) = 4F$ $V_{DE} = 0$ $W_{DE} = 0$ $H_{ED} = -4(W/b) = -4F$ $V_{ED} = 0$ $W_{ED} = 0$
$H_{AD} = 0$ $V_{AD} = 0$ $W_{AD} = Fb = Fb$ $H_{DA} = 0$ $V_{DA} = 0$ $W_{DA} = -Fb = -Fb$	$H_{DF} = -4(W/b) = -4F$ $V_{DF} = 0$ $W_{DF} = Fb = Fb$ $H_{FD} = 4(W/b) + 2qb = 6F$ $V_{FD} = 0$ $W_{FD} = -Fb + 4W + qb^2 = 4Fb$	$H_{BE} = -F - 4(W/b) = -5F$ $V_{BE} = 0$ $W_{BE} = Fb + 4W = 5Fb$ $H_{EB} = F + 4(W/b) = 5F$ $V_{EB} = 0$ $W_{EB} = 0$

CdSdC BG04 Isostatica Esempio 4

Q





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.

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

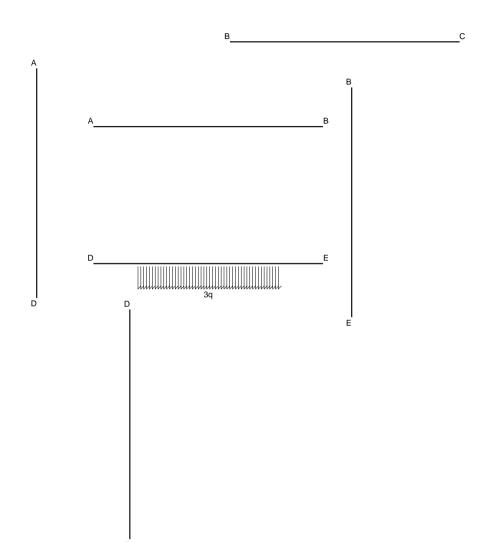
Determinare matrice di congruenza e di equilibrio.

Svolgere l'analisi cinematica.

ω,W

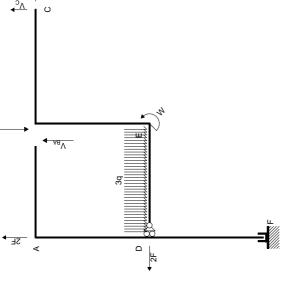
Ω





REAZIONI $H_C = V_C =$	$H_F = W_F =$	
$H_{AB} = V_{AB} = W_{AB} = H_{BA} = V_{BA} = W_{BA} = W$	$H_{BC} = V_{BC} = V_{BC} = W_{BC} = H_{CB} = V_{CB} = W_{CB} = W$	$H_{DE} = V_{DE} = V_{DE} = W_{DE} = V_{ED} = W_{ED} = W$
$H_{AD} = V_{AD} = V_{AD} = W_{AD} = V_{DA} = V$	$\begin{aligned} H_{DF} &= \\ V_{DF} &= \\ W_{DF} &= \\ H_{FD} &= \\ V_{FD} &= \\ W_{FD} &= \end{aligned}$	$H_{BE} = V_{BE} = W_{BE} = H_{EB} = V_{EB} = W_{EB} = W$

EQUILIBRIO Nome:



2F

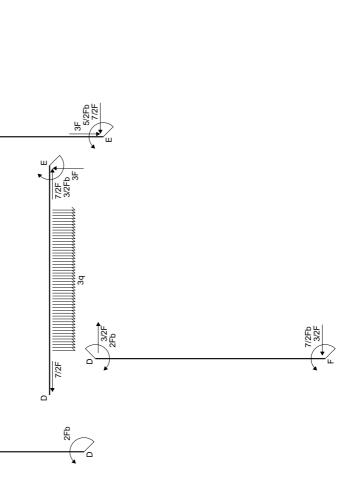
EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

 $V_c = -2F + 3qb$

Traslazione verticale: aste DE EB BC

 V_c - V_{BA} = 3qb Rotazione intorno a D: aste DE EB BC - H_c b +2 V_c b - V_{BA} b = -W +3/2qb²

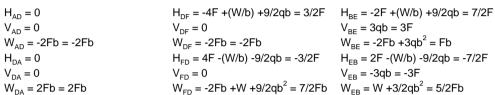


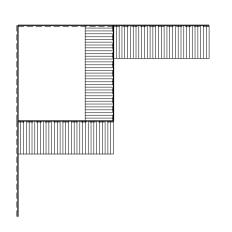
Soluzione del sistema

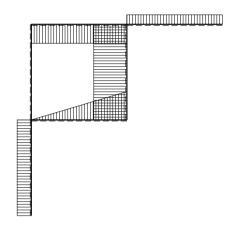


$$\begin{array}{ll} {\rm H_C = -2F + (W/b) + 9/2qb = 7/2F} & {\rm H_F = 4F - (W/b) - 9/2qb = -3/2F} \\ {\rm V_C = -2F + 3qb = F} & {\rm W_F = -2Fb + W + 9/2qb^2 = 7/2Fb} \end{array}$$

$$\begin{array}{lll} H_{AB} = 0 & H_{BC} = 2F \cdot (W/b) \cdot 9/2qb = -7/2F & H_{DE} = 2F \cdot (W/b) \cdot 9/2qb = -7/2F \\ V_{AB} = 2F = 2F & V_{BC} = 2F \cdot 3qb = -F & V_{DE} = 0 \\ W_{AB} = 2Fb = 2Fb & W_{BC} = 2Fb \cdot 3qb^2 = -Fb & W_{DE} = 0 \\ H_{BA} = 0 & H_{CB} = -2F \cdot (W/b) \cdot 9/2qb = 7/2F & H_{ED} = -2F \cdot (W/b) \cdot 9/2qb = 7/2F \\ V_{BA} = -2F = -2F & V_{CB} = -2F \cdot 3qb = F & V_{ED} = 3qb = 3F \\ W_{BA} = 0 & W_{CB} = 0 & W_{CB} = -3/2qb^2 = -3/2Fb \end{array}$$

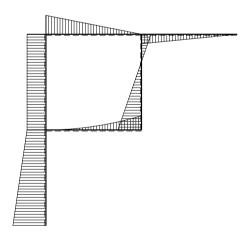










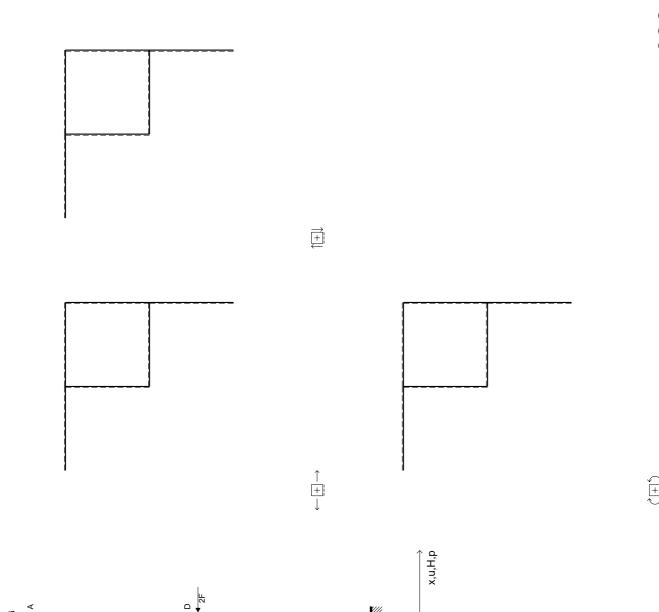


CdSdC BG04 Isostatica Esempio 4

y,v,V,q

Q

Ω



Svolgere l'analisi cinematica.

 $q_{DE} = -3q = -3F/b$

 $W_E = W = Fb$

 $V_A = 2F$

 $H_D = -2F$ ω,W

Δ

Determinare matrice di congruenza e di equilibrio.

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

Carichi e deformazioni date hanno verso efficace in disegno.

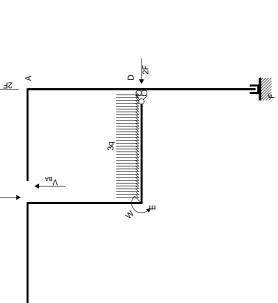
Calcolare reazioni vincolari della struttura e delle aste.

Tracciare i diagrammi delle azioni interne nelle aste.

@ Adolfo Zavelani Rossi, Politecnico di Milano

REAZIONI $H_C = V_C =$	$H_F = W_F =$	
$H_{AB} = V_{AB} = V_{AB} = W_{AB} = H_{BA} = V_{BA} = W_{BA} =$		$\begin{aligned} \mathbf{H}_{\mathrm{BC}} &= \\ \mathbf{V}_{\mathrm{BC}} &= \\ \mathbf{W}_{\mathrm{BC}} &= \\ \mathbf{H}_{\mathrm{CB}} &= \\ \mathbf{V}_{\mathrm{CB}} &= \\ \mathbf{W}_{\mathrm{CB}} &= \end{aligned}$
$H_{DE} = V_{DE} = V_{DE} = W_{DE} = H_{ED} = V_{ED} = W_{ED} = W_{ED} = V_{ED} = V$		$H_{AD} = V_{AD} = V_{AD} = W_{AD} = V_{DA} = V$
$H_{DF} = V_{DF} = V_{DF} = W_{DF} = H_{FD} = V_{FD} = W_{FD} = W$		$H_{BE} = V_{BE} = W_{BE} = H_{EB} = V_{EB} = W_{EB} = W$

EQUILIBRIO Nome:



EQUAZIONI DI EQUILIBRIO

Traslazione verticale globale

 $V_c = -2F + 3qb$

Traslazione verticale: aste DE EB BC

 V_c - V_{BA} = 3qb Rotazione intorno a D: aste DE EB BC - H_c b - $2V_c$ b + V_{BA} b = -W -3/2qb²

Matrice di equilibrio
$$\begin{bmatrix} H_{c}b & V_{c}b & V_{BA}b \end{bmatrix} & \begin{bmatrix} Fb & W & qb \\ -2 & 0 & 3 \\ 0 & 1 & -1 \end{bmatrix}$$
 v_F
$$\begin{bmatrix} 0 & 1 & -1 \\ 0 & 1 & -2 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 3 \\ 0 & -1 & -3 \end{bmatrix}$$

Soluzione del sistema
$$\begin{bmatrix} V_{c}b \\ V_{bh}b \end{bmatrix} = \begin{bmatrix} -2 & 0 & 3 \\ -2 & 0 & 0 \\ 2 & 1 & -9/2 \end{bmatrix}$$

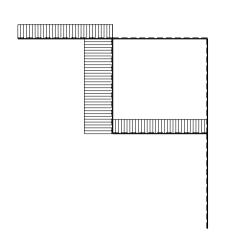


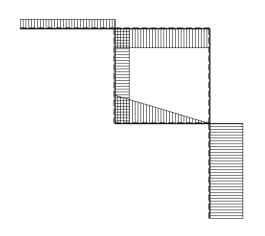
$$\begin{array}{ll} H_C = 2F + (W/b) - 9/2qb = -3/2F & H_F = -(W/b) + 9/2qb = 7/2F \\ V_C = -2F + 3qb = F & W_F = -2Fb + W - 9/2qb^2 = -11/2Fb \end{array}$$

$$\begin{array}{lll} H_{AB} = 0 & H_{BC} = -2F - (W/b) + 9/2qb = 3/2F \\ V_{AB} = 2F = 2F & V_{BC} = 2F - 3qb = -F \\ W_{AB} = -2Fb = -2Fb & W_{BC} = -2Fb + 3qb^2 = Fb \\ H_{BA} = 0 & H_{CB} = 2F + (W/b) - 9/2qb = -3/2F \\ V_{BA} = -2F = -2F & V_{CB} = -2F + 3qb = F \\ W_{BA} = 0 & W_{CB} = 0 \end{array}$$

$$\begin{split} &H_{DE} = -2F - (W/b) + 9/2qb = 3/2F & H_{AD} = 0 \\ &V_{DE} = 0 & V_{AD} = 0 \\ &W_{DE} = 0 & W_{AD} = 2Fb = 2Fb \\ &H_{ED} = 2F + (W/b) - 9/2qb = -3/2F & H_{DA} = 0 \\ &V_{ED} = 3qb = 3F & V_{DA} = 0 \\ &W_{ED} = 3/2qb^2 = 3/2Fb & W_{DA} = -2Fb = -2Fb \end{split}$$

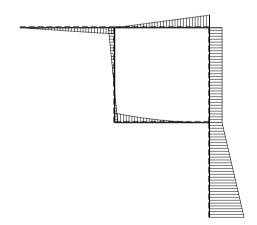
$$\begin{split} H_{DF} &= (W/b) - 9/2qb = -7/2F \\ V_{DF} &= 0 \\ W_{DF} &= 2Fb = 2Fb \\ H_{FD} &= -(W/b) + 9/2qb = 7/2F \\ V_{FD} &= 0 \\ W_{DF} &= 2Fb - 3qb^2 = -Fb \\ H_{EB} &= -2F - (W/b) + 9/2qb = 3/2F \\ V_{FD} &= 0 \\ V_{EB} &= -3qb = -3F \\ W_{FB} &= W - 3/2qb^2 = -1/2Fb \end{split}$$









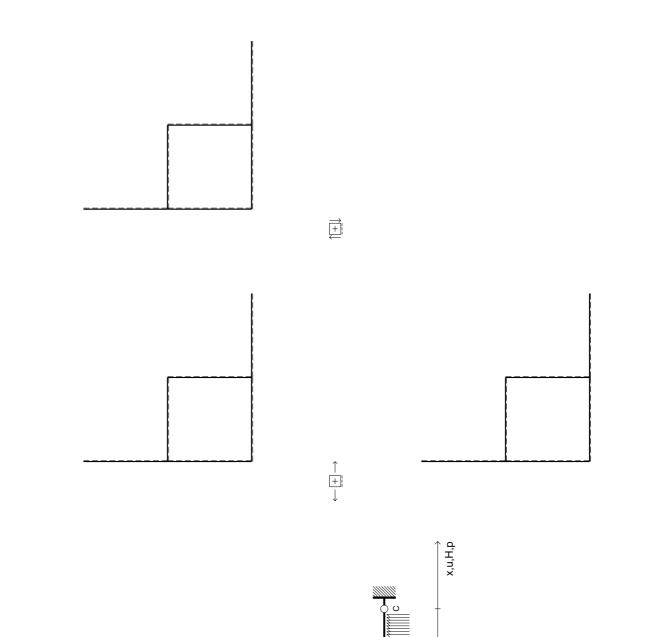


CdSdC BG04 Isostatica Esempio 4

y,v,V,q [←]

Q

Ω



Svolgere l'analisi cinematica.

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

 $W_A = -2W = -2Fb$

 $H_E = -3F$

 $V_B = 2F$ 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 B col PLV (Le=0).

Carichi e deformazioni date hanno verso efficace in disegno.

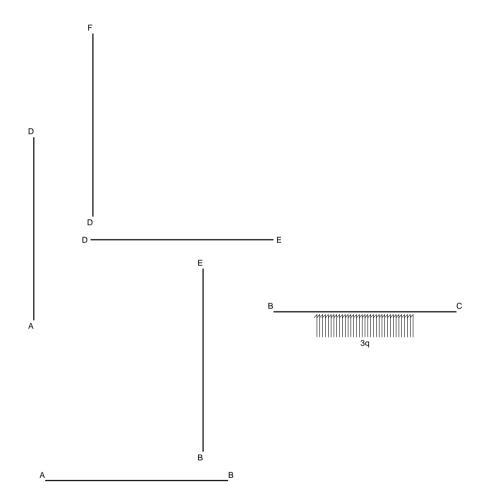
Calcolare reazioni vincolari della struttura e delle aste.

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

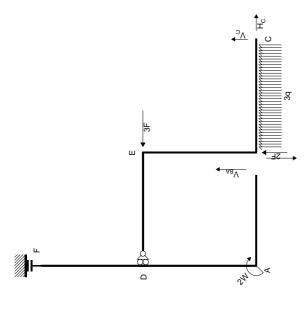


H _C =	$V_F =$
V _C =	$W_F =$

$H_{AD} =$	$H_{DF} =$	H _{BE} =
$V_{AD} =$	$V_{DF} =$	$V_{BE} =$
$W_{AD} =$	$W_{DF} =$	$W_{BE} =$
$H_{DA} =$	H _{FD} =	H _{EB} =
$V_{DA} =$	V _{FD} =	$V_{EB} =$
$W_{DA} =$	$W_{FD} =$	$W_{EB} =$



EQUILIBRIO Nome:



EQUAZIONI DI EQUILIBRIO

Traslazione orizzontale globale

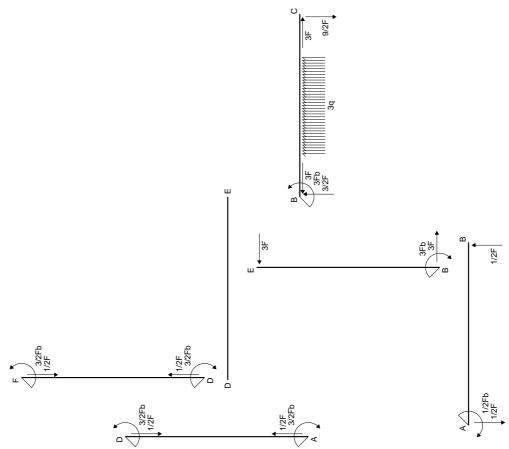
 $H_c = 3F$

Traslazione verticale: aste DE EB BC

 V_c - V_{BA} = -2F -3qb Rotazione intorno a D: aste DE EB BC H_c^b +2 V_c^b - V_{BA}^b = -2Fb -9/2qb²

Matrice di equilibrio
$$\begin{bmatrix} H_{c}b & V_{c}b & V_{BA}b \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} Fb & W & qb^2 \\ 3 & 0 & 0 \\ 0 & 1 & -1 \end{bmatrix} = \begin{bmatrix} -2 & 0 & -3 \\ -2 & 0 & -9/2 \end{bmatrix}$$

Soluzione del sistema
$$\begin{bmatrix} \mathsf{Fb} & \mathsf{W} & \mathsf{qb}^2 \end{bmatrix} \\ \mathsf{H}_\mathsf{C}\mathsf{b} \\ \mathsf{V}_\mathsf{C}\mathsf{b} \end{bmatrix} = \begin{bmatrix} 3 & 0 & 0 \\ -3 & 0 & -3/2 \\ -1 & 0 & 3/2 \end{bmatrix}$$



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



$$H_C = 3F = 3F$$
 $V_F = F - 3/2qb = -1/2F$ $V_C = -3F - 3/2qb = -9/2F$ $W_F = Fb + 2W - 3/2qb^2 = 3/2Fb$

$$\begin{split} &H_{AD} = 0 & H_{DF} = 0 & H_{BE} = 3F = 3F \\ &V_{AD} = -F + 3/2qb = 1/2F & V_{DF} = -F + 3/2qb = 1/2F & V_{BE} = 0 \\ &W_{AD} = -Fb - 2W + 3/2qb^2 = -3/2Fb & W_{DF} = -Fb - 2W + 3/2qb^2 = -3/2Fb & W_{BE} = -3Fb = -3Fb \\ &H_{DA} = 0 & H_{FD} = 0 & H_{EB} = -3F = -3F \\ &V_{DA} = F - 3/2qb = -1/2F & V_{FD} = F - 3/2qb = -1/2F & V_{FB} = 0 \end{split}$$

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

 $W_{FR} = 0$

