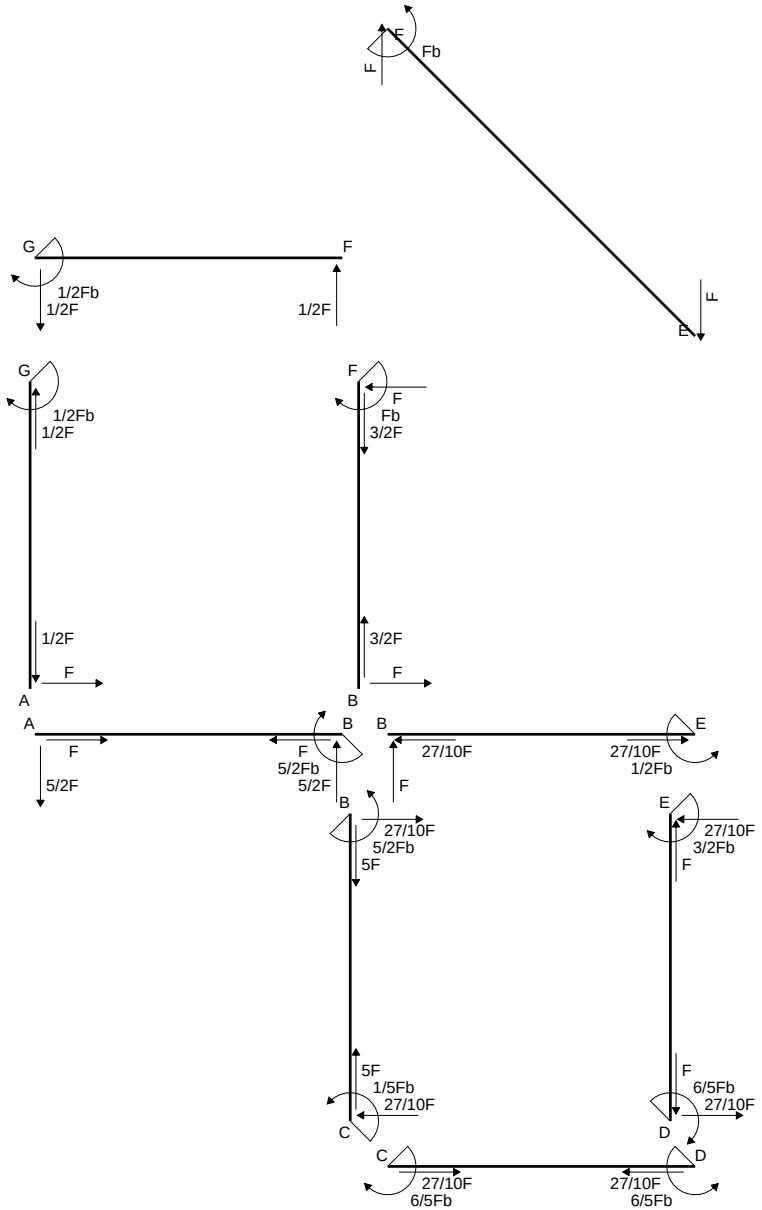
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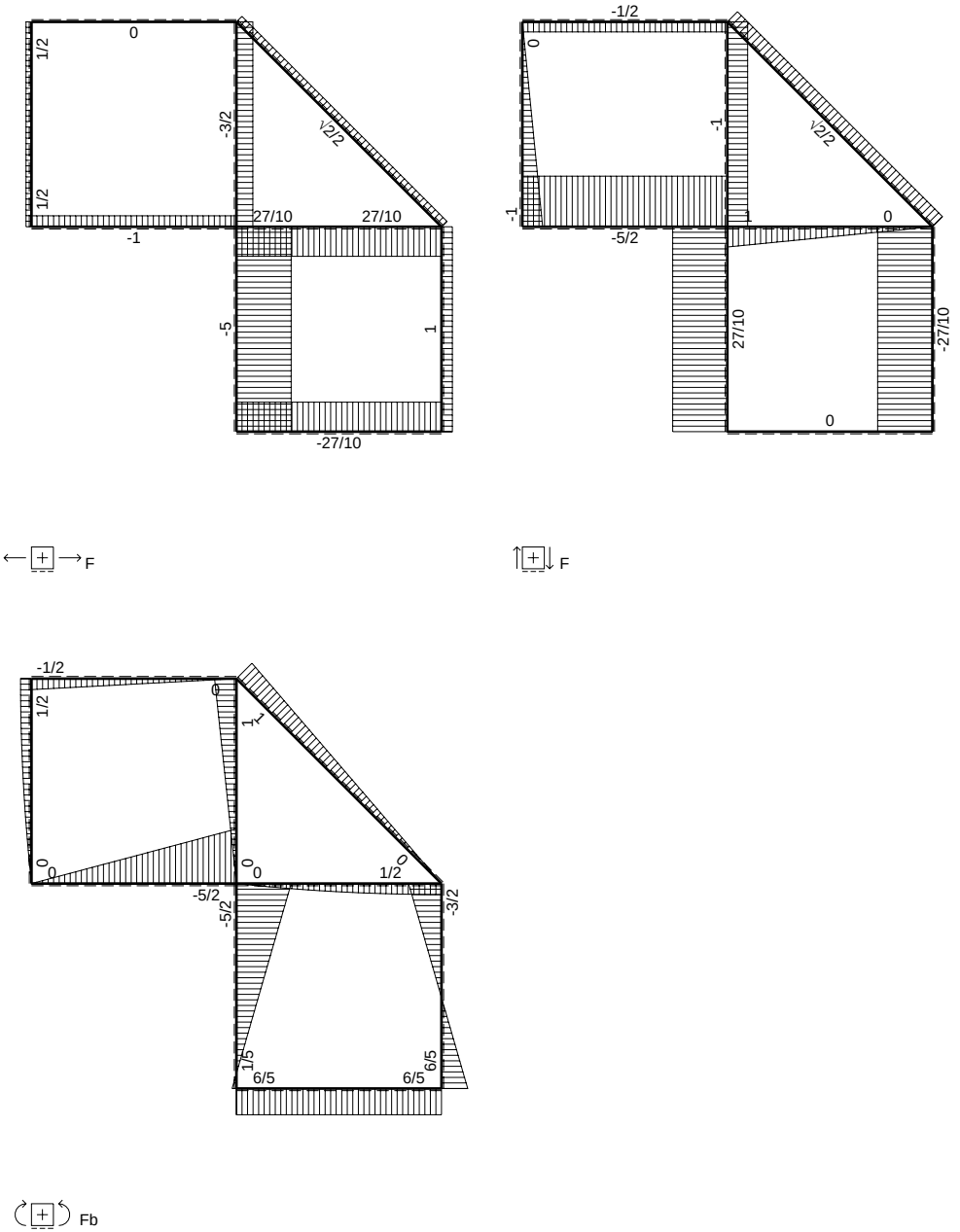
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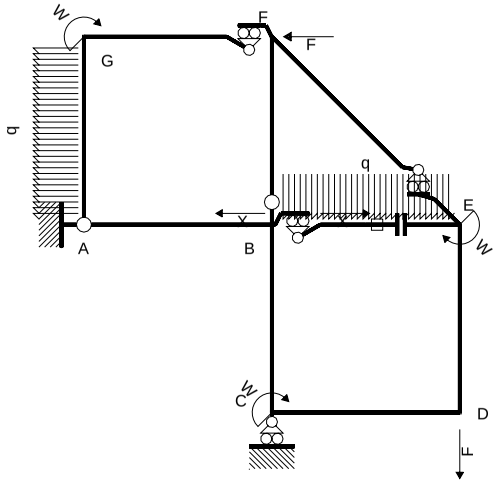
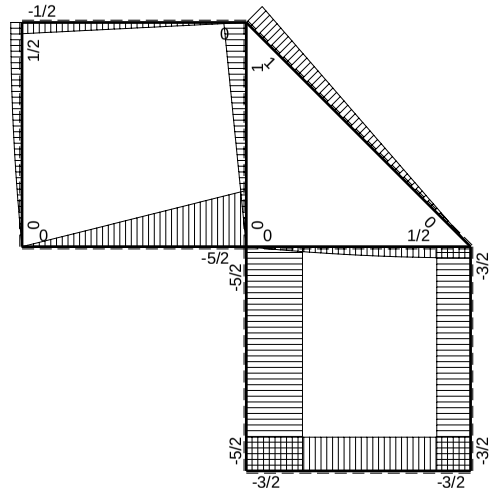
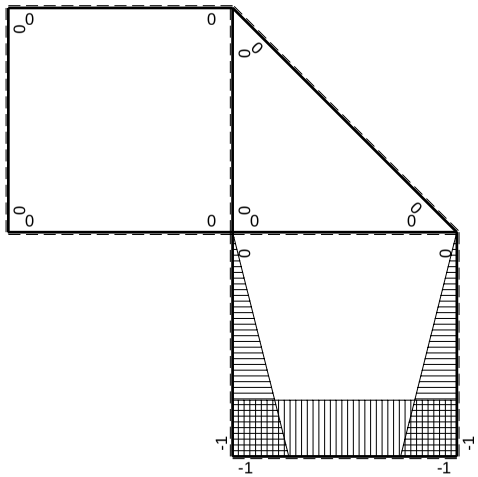


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=H_{BE}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-5/2Fx	0	0	0	0
BA b	0	5/2Fb-5/2Fx	0	0		
BC b	-x	-5/2Fb	5/2Fbx	x^2	$5/4Fb^3/EJ$	$1/3Xb^3/EJ$
CB b	b-x	5/2Fb	$5/2Fb^2-5/2Fbx$	$b^2-2bx+x^2$		
CD b	-b	-3/2Fb	$3/2Fb^2$	b^2	$3/2Fb^3/EJ$	Xb^3/EJ
DC b	b	3/2Fb	$3/2Fb^2$	b^2		
DE b	-b+x	-3/2Fb	$3/2Fb^2-3/2Fbx$	$b^2-2bx+x^2$	$3/4Fb^3/EJ$	$1/3Xb^3/EJ$
ED b	x	3/2Fb	3/2Fbx	x^2		
EF √2b	0	√2/2Fx	0	0	0	0
FG b	0	-1/2Fx	0	0	0	0
GF b	0	1/2Fb-1/2Fx	0	0		
GA b	0	$1/2Fb-1/2qx^2$	0	0	0	0
AG b	0	$-Fx+1/2qx^2$	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	$Fx-1/2qx^2$	0	0	0	0
EB b	0	$-1/2Fb+1/2qx^2$	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^3/EJ	
	totali				$9/2Fb^3/EJ$	$5/3Xb^3/EJ$
	iperstatica $X=H_{BE}$				-27/10F	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2) \, b^2 \, 1/EJ \, dx = [1/3 \, x^3/b^2]_o^b \, b^2 \, 1/EJ$

$= (1/3 \, b) \, b^2 \, 1/EJ = 1/3 \, b^3/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2 \, x/b + x^2/b^2) \, b^2 \, 1/EJ \, dx = [x - x^2/b +1/3 \, x^3/b^2]_o^b \, b^2 \, 1/EJ$

$= (b - b +1/3 \, b) \, b^2 \, 1/EJ = 1/3 \, b^3/EJ$

$L^{XX}_{CD} = \int_o^b (1) \, b^2 \, 1/EJ \, dx = [x]_o^b \, b^2 \, 1/EJ$

$= (b) \, b^2 \, 1/EJ = b^3/EJ$

$L^{XX}_{DC} = \int_o^b (1) \, b^2 \, 1/EJ \, dx = [x]_o^b \, b^2 \, 1/EJ$

$= (b) \, b^2 \, 1/EJ = b^3/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2 \, x/b + x^2/b^2) \, b^2 \, 1/EJ \, dx = [x - x^2/b +1/3 \, x^3/b^2]_o^b \, b^2 \, 1/EJ$

$= (b - b +1/3 \, b) \, b^2 \, 1/EJ = 1/3 \, b^3/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2) \, b^2 \, 1/EJ \, dx = [1/3 \, x^3/b^2]_o^b \, b^2 \, 1/EJ$

$= (1/3 \, b) \, b^2 \, 1/EJ = 1/3 \, b^3/EJ$

$L^{Xo}_{BC} = \int_o^b (5/2 \, x/b) \, Fb^2 \, 1/EJ \, dx = [5/4 \, x^2/b]_o^b \, Fb^2 \, 1/EJ$

$= (5/4 \, b) \, Fb^2 \, 1/EJ = 5/4 \, Fb^3/EJ$

$L^{Xo}_{CB} = \int_o^b (5/2 -5/2 \, x/b) \, Fb^2 \, 1/EJ \, dx = [5/2 \, x -5/4 \, x^2/b]_o^b \, Fb^2 \, 1/EJ$

$= (5/2 \, b -5/4 \, b) \, Fb^2 \, 1/EJ = 5/4 \, Fb^3/EJ$

$L^{Xo}_{CD} = \int_o^b (3/2) \, Fb^2 \, 1/EJ \, dx = [3/2 \, x]_o^b \, Fb^2 \, 1/EJ$

$= (3/2 \, b) \, Fb^2 \, 1/EJ = 3/2 \, Fb^3/EJ$

$L^{Xo}_{DC} = \int_o^b (3/2) \, Fb^2 \, 1/EJ \, dx = [3/2 \, x]_o^b \, Fb^2 \, 1/EJ$

$= (3/2 \, b) \, Fb^2 \, 1/EJ = 3/2 \, Fb^3/EJ$

$L^{Xo}_{DE} = \int_o^b (3/2 -3/2 \, x/b) \, Fb^2 \, 1/EJ \, dx = [3/2 \, x -3/4 \, x^2/b]_o^b \, Fb^2 \, 1/EJ$

$= (3/2 \, b -3/4 \, b) \, Fb^2 \, 1/EJ = 3/4 \, Fb^3/EJ$

$L^{Xo}_{ED} = \int_o^b (3/2 \, x/b) \, Fb^2 \, 1/EJ \, dx = [3/4 \, x^2/b]_o^b \, Fb^2 \, 1/EJ$

$= (3/4 \, b) \, Fb^2 \, 1/EJ = 3/4 \, Fb^3/EJ$

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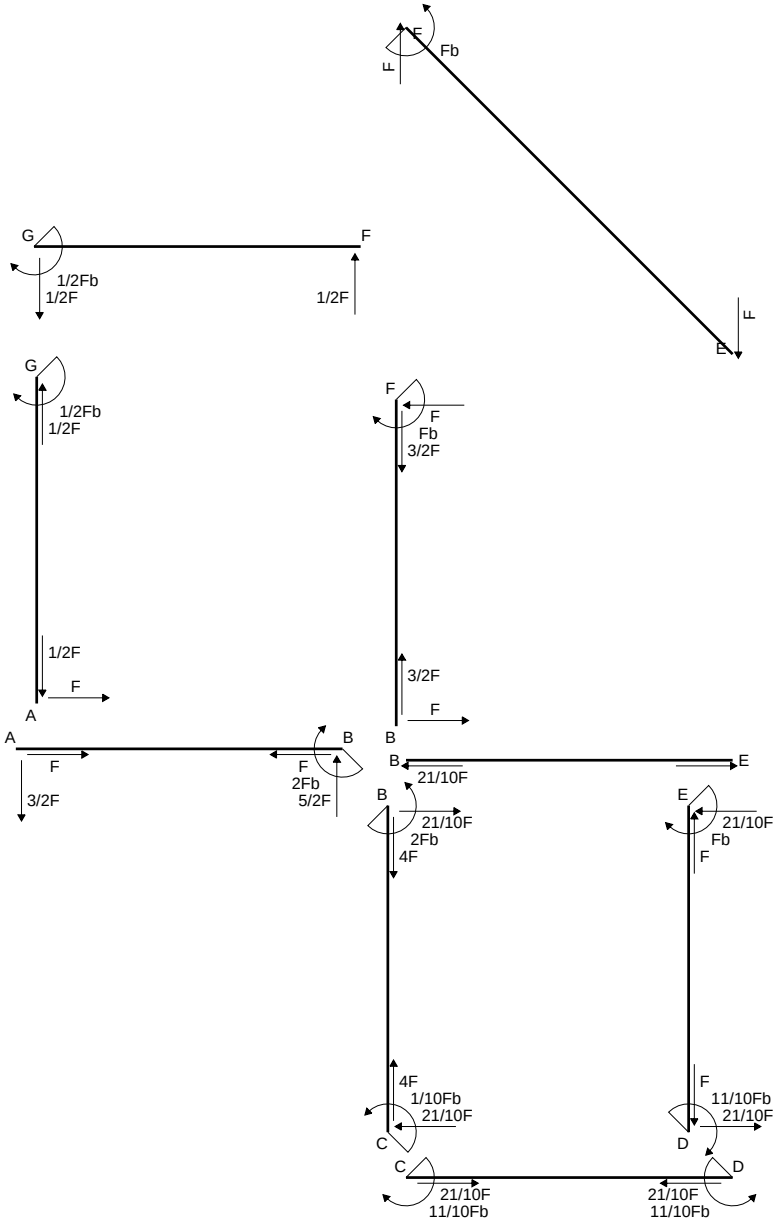
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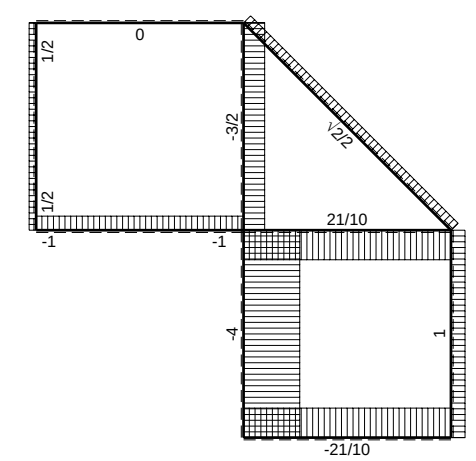
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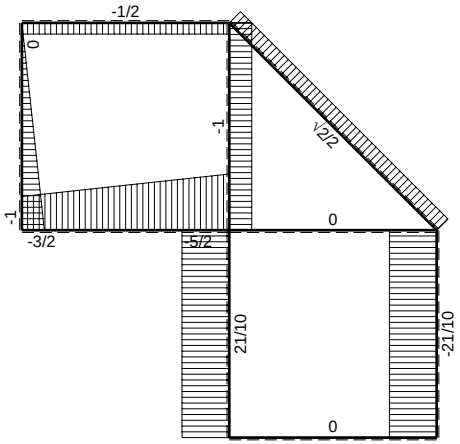
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-21/10
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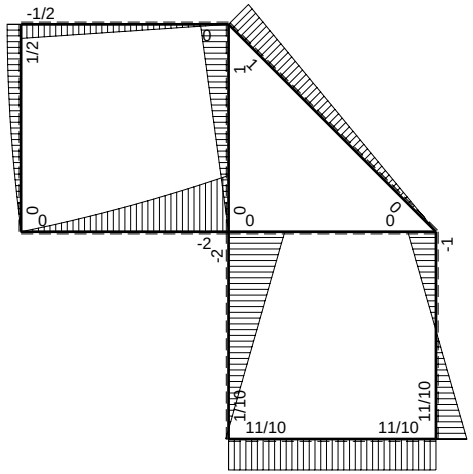
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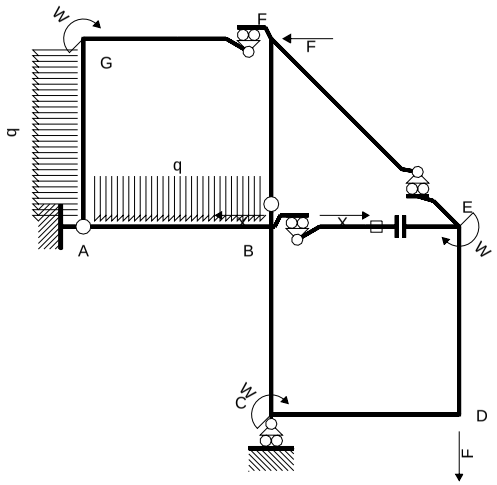
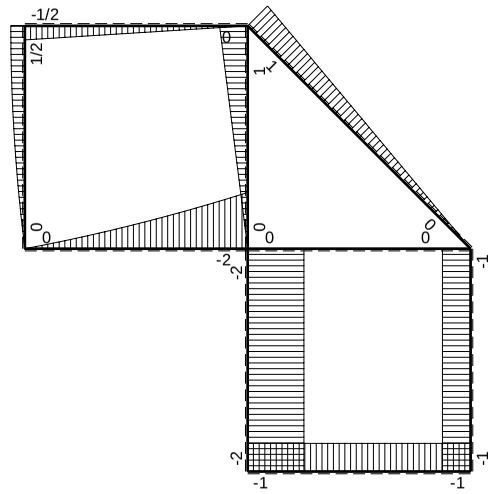
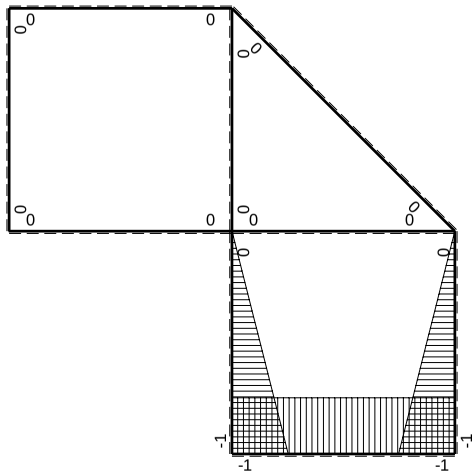


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=H_{BE}$

→	$M_x(x)$	$M_0(x)$	M_xM_0	M_xM_x	$\int M_xM_0/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	$-3/2Fx-1/2qx^2$	0	0	0	0
BA b	0	$2Fb-5/2Fx+1/2qx^2$	0	0		
BC b	-x	-2Fb	2Fbx	x^2	Fb^3/EJ	$1/3Xb^3/EJ$
CB b	b-x	2Fb	$2Fb^2-2Fbx$	$b^2-2bx+x^2$		
CD b	-b	-Fb	Fb^2	b^2	Fb^3/EJ	Xb^3/EJ
DC b	b	Fb	Fb^2	b^2		
DE b	-b+x	-Fb	Fb^2-Fbx	$b^2-2bx+x^2$	$1/2Fb^3/EJ$	$1/3Xb^3/EJ$
ED b	x	Fb	Fbx	x^2		
EF √2b	0	√2/2Fx	0	0	0	0
FG b	0	-1/2Fx	0	0	0	0
GF b	0	1/2Fb-1/2Fx	0	0		
GA b	0	$1/2Fb-1/2qx^2$	0	0	0	0
AG b	0	$-Fx+1/2qx^2$	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^3/EJ	
	totali				$7/2Fb^3/EJ$	$5/3Xb^3/EJ$
	iperstatica $X=H_{BE}$				-21/10F	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\, b^2\, 1/EJ\, dx = [1/3\, x^3/b^2]_o^b\, b^2\, 1/EJ$

$= (1/3\, b)\, b^2\, 1/EJ = 1/3\ b^3/EJ$

$L^{XX}_{CB} = \int_o^b (1 - 2\, x/b + x^2/b^2)\, b^2\, 1/EJ\, dx = [\, x - x^2/b + 1/3\, x^3/b^2]_o^b\, b^2\, 1/EJ$

$= (\, b - b + 1/3\, b)\, b^2\, 1/EJ = 1/3\ b^3/EJ$

$L^{XX}_{CD} = \int_o^b (1)\, b^2\, 1/EJ\, dx = [\, x]_o^b\, b^2\, 1/EJ$

$= (\, b)\, b^2\, 1/EJ = b^3/EJ$

$L^{XX}_{DC} = \int_o^b (1)\, b^2\, 1/EJ\, dx = [\, x]_o^b\, b^2\, 1/EJ$

$= (\, b)\, b^2\, 1/EJ = b^3/EJ$

$L^{XX}_{DE} = \int_o^b (1 - 2\, x/b + x^2/b^2)\, b^2\, 1/EJ\, dx = [\, x - x^2/b + 1/3\, x^3/b^2]_o^b\, b^2\, 1/EJ$

$= (\, b - b + 1/3\, b)\, b^2\, 1/EJ = 1/3\ b^3/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\, b^2\, 1/EJ\, dx = [1/3\, x^3/b^2]_o^b\, b^2\, 1/EJ$

$= (1/3\, b)\, b^2\, 1/EJ = 1/3\ b^3/EJ$

$L^{Xo}_{BC} = \int_o^b (2\, x/b)\, Fb^2\, 1/EJ\, dx = [\, x^2/b]_o^b\, Fb^2\, 1/EJ$

$= (\, b)\, Fb^2\, 1/EJ = Fb^3/EJ$

$L^{Xo}_{CB} = \int_o^b (2 - 2\, x/b)\, Fb^2\, 1/EJ\, dx = [2\, x - x^2/b]_o^b\, Fb^2\, 1/EJ$

$= (2\, b - b)\, Fb^2\, 1/EJ = Fb^3/EJ$

$L^{Xo}_{CD} = \int_o^b (1)\, Fb^2\, 1/EJ\, dx = [\, x]_o^b\, Fb^2\, 1/EJ$

$= (\, b)\, Fb^2\, 1/EJ = Fb^3/EJ$

$L^{Xo}_{DC} = \int_o^b (1)\, Fb^2\, 1/EJ\, dx = [\, x]_o^b\, Fb^2\, 1/EJ$

$= (\, b)\, Fb^2\, 1/EJ = Fb^3/EJ$

$L^{Xo}_{DE} = \int_o^b (1 - x/b)\, Fb^2\, 1/EJ\, dx = [\, x - 1/2\, x^2/b]_o^b\, Fb^2\, 1/EJ$

$= (\, b - 1/2\, b)\, Fb^2\, 1/EJ = 1/2\ Fb^3/EJ$

$L^{Xo}_{ED} = \int_o^b (\, x/b)\, Fb^2\, 1/EJ\, dx = [1/2\, x^2/b]_o^b\, Fb^2\, 1/EJ$

$= (1/2\, b)\, Fb^2\, 1/EJ = 1/2\ Fb^3/EJ$

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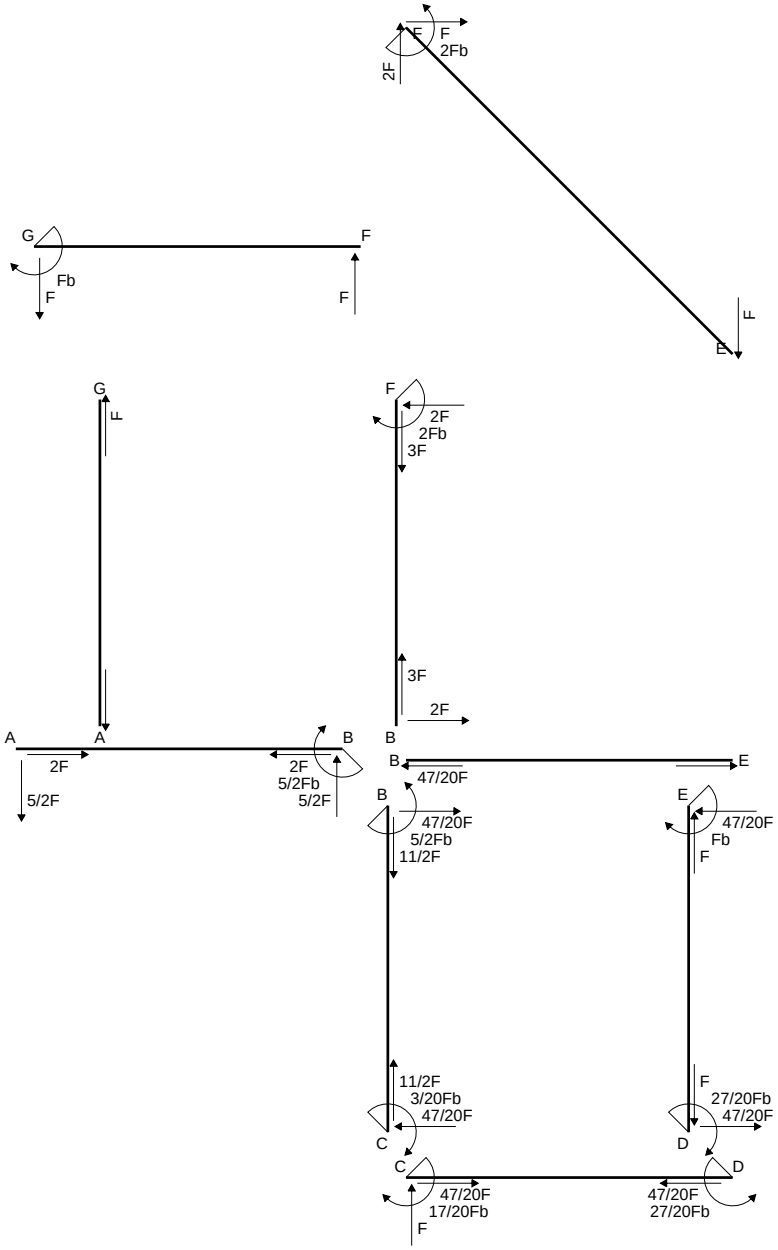
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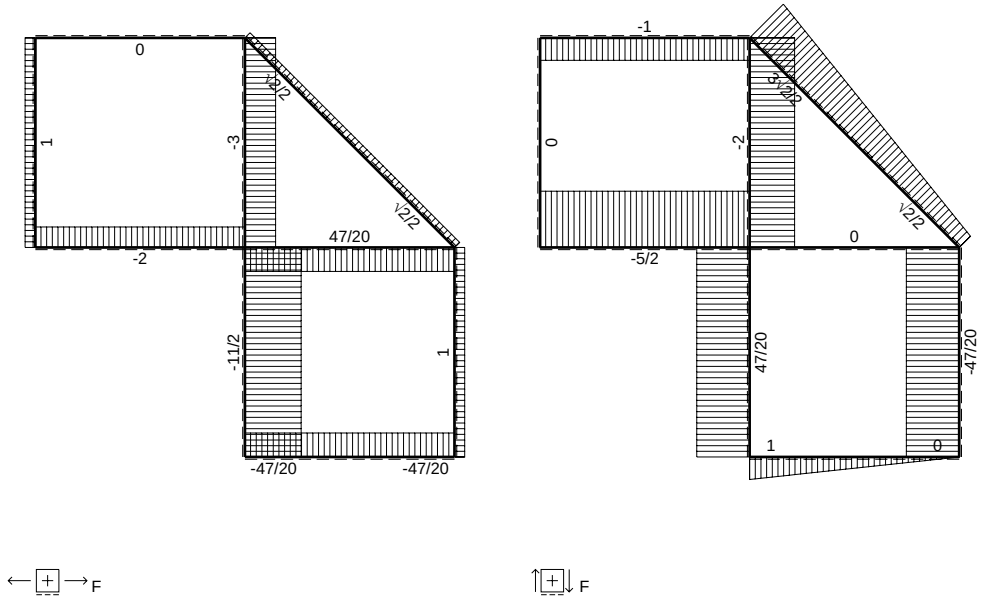
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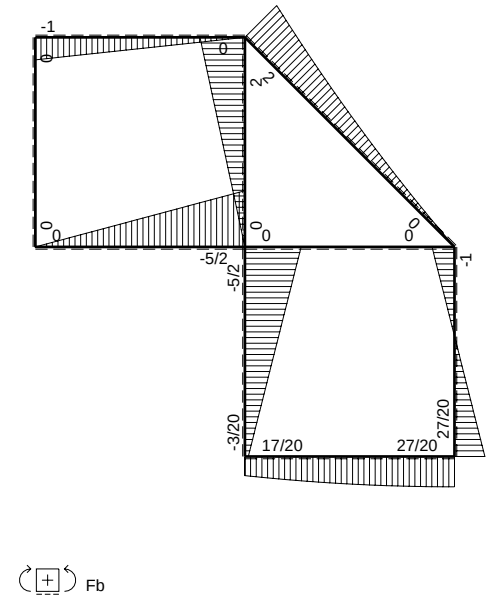
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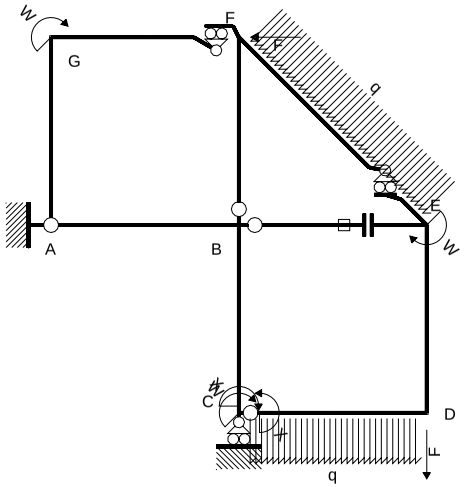
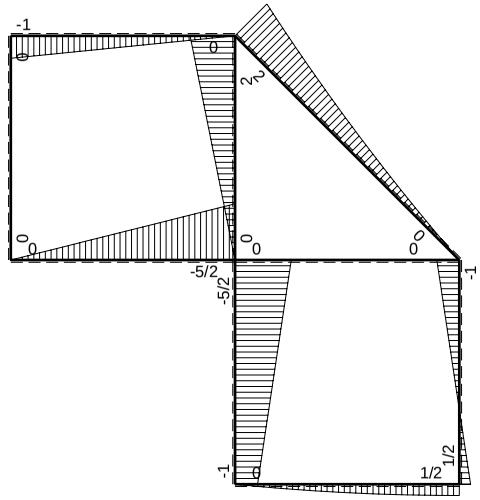
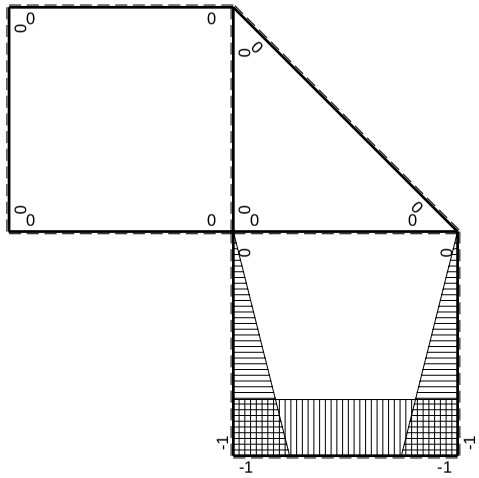


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-5/2Fx	0	0	0	0
BA b	0	5/2Fb-5/2Fx	0	0		
BC b	-x/b	-5/2Fb+3/2Fx	5/2Fx-3/2Fx²/b	x²/b²	3/4Fb²/EJ	1/3Xb/EJ
CB b	1-x/b	Fb+3/2Fx	Fb+1/2Fx-3/2Fx²/b	1-2x/b+x²/b²		
CD b	-1	Fx-1/2qx²	-Fx+1/2Fx²/b	1	-1/3Fb²/EJ	Xb/EJ
DC b	1	-1/2Fb+1/2qx²	-1/2Fb+1/2Fx²/b	1		
DE b	-1+x/b	1/2Fb-3/2Fx	-1/2Fb+2Fx-3/2Fx²/b	1-2x/b+x²/b²	0	1/3Xb/EJ
ED b	x/b	Fb-3/2Fx	Fx-3/2Fx²/b	x²/b²		
EF √2b	0	√2/2Fx+1/2qx²	0	0	0	0
FG b	0	-Fx	0	0	0	0
GF b	0	Fb-Fx	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	2Fb-2Fx	0	0	0	0
BF b	0	-2Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^2/EJ	
	totali				$17/12Fb^2/EJ$	5/3Xb/EJ
	iperstatica $X=W_{CD}$				-17/20Fb	

Sviluppi di calcolo iperstatica

PROCEDIMENTO E RISULTATI 982642 ESΣ2.xxxx.025

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$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2\ )\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (5/2\ x/b -3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [5/4\ x^2/b -1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (5/4\ b -1/2\ b\ )\ Fb\ 1/EJ\ = 3/4\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (1 +1/2\ x/b -3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [\ x +1/4\ x^2/b -1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b +1/4\ b -1/2\ b\ )\ Fb\ 1/EJ\ = 3/4\ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-\ x/b +1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-1/2\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +1/6\ b\ )\ Fb\ 1/EJ\ = -1/3\ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2 +1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-1/2\ x +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +1/6\ b\ )\ Fb\ 1/EJ\ = -1/3\ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (-1/2 +2\ x/b -3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-1/2\ x + x^2/b -1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b + b -1/2\ b\ )\ Fb\ 1/EJ\ = 0$

$L^{Xo}_{ED} = \int_o^b (\ x/b -3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [1/2\ x^2/b -1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/2\ b\ )\ Fb\ 1/EJ\ = 0$

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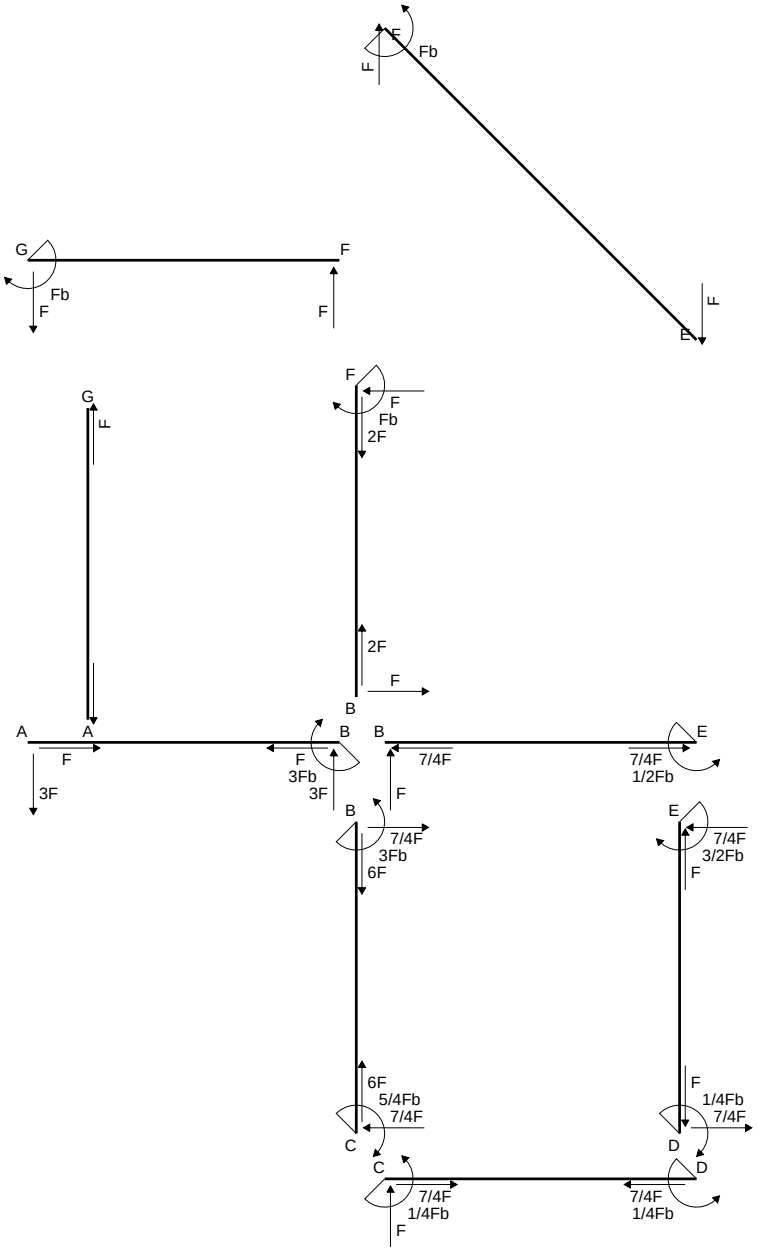
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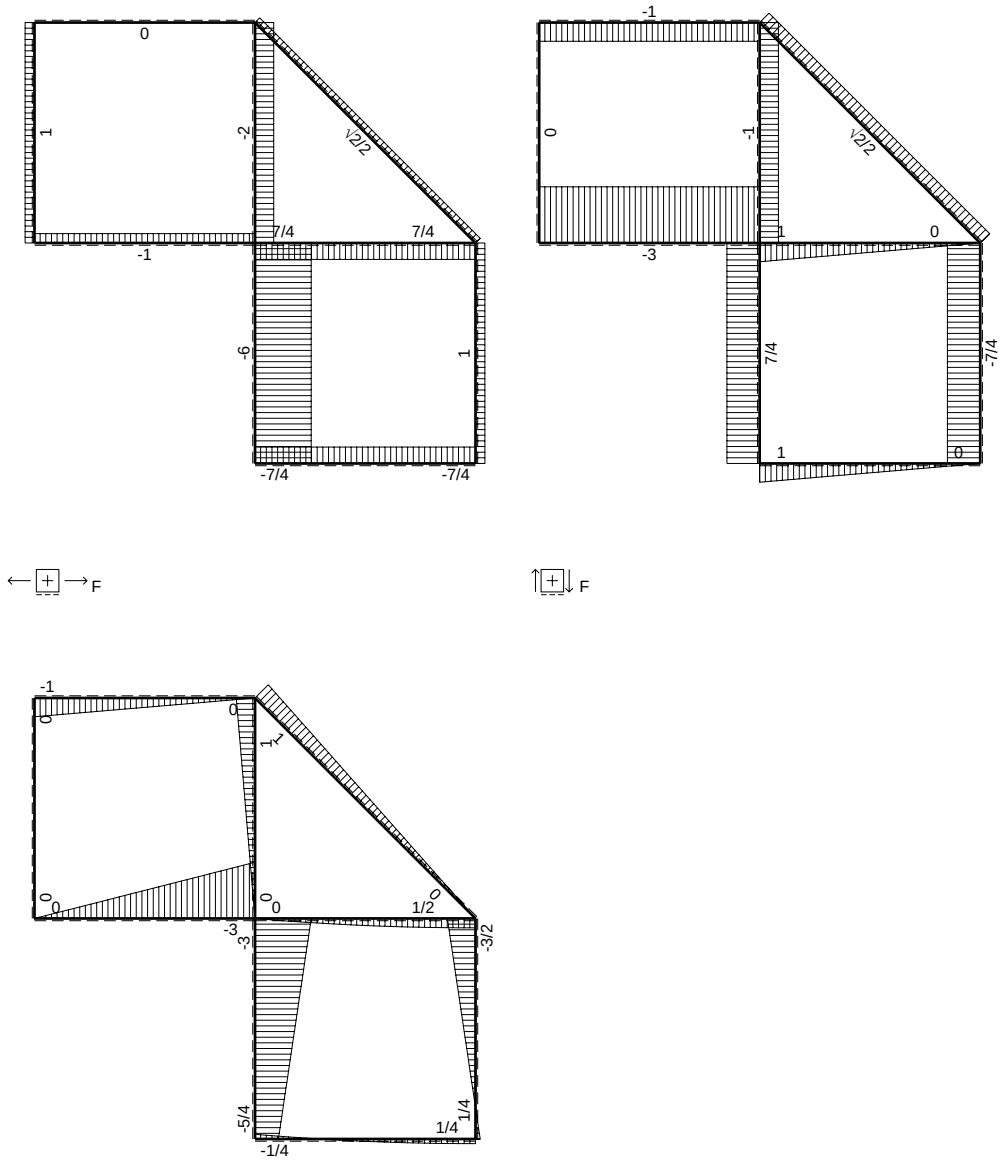
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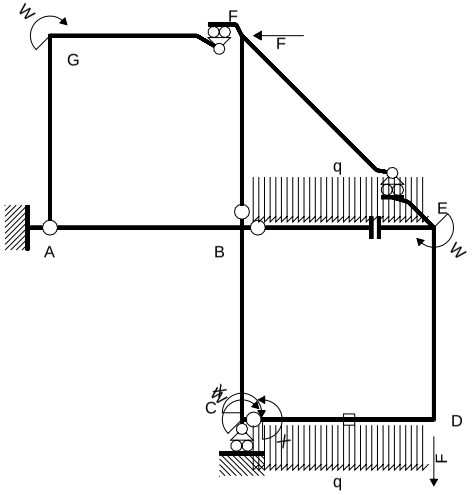
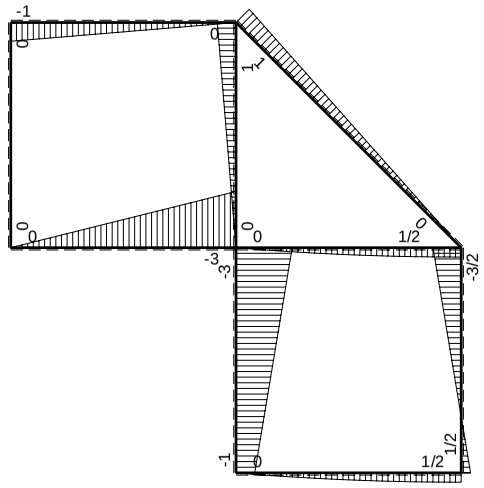
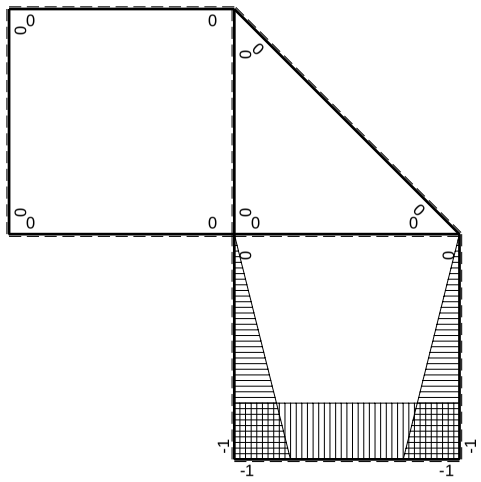


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_0(x)$	M_xM_0	M_xM_x	$\int M_xM_0/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-3Fx	0	0	0	0
BA b	0	3Fb-3Fx	0	0		
BC b	-x/b	-3Fb+2Fx	$3Fx-2Fx^2/b$	x^2/b^2	$5/6Fb^2/EJ$	$1/3Xb/EJ$
CB b	1-x/b	Fb+2Fx	$Fb+Fx-2Fx^2/b$	$1-2x/b+x^2/b^2$		
CD b	-1	$Fx-1/2qx^2$	$-Fx+1/2Fx^2/b$	1	$-1/3Fb^2/EJ$	Xb/EJ
DC b	1	$-1/2Fb+1/2qx^2$	$-1/2Fb+1/2Fx^2/b$	1		
DE b	-1+x/b	1/2Fb-2Fx	$-1/2Fb+5/2Fx-2Fx^2/b$	$1-2x/b+x^2/b^2$	$1/12Fb^2/EJ$	$1/3Xb/EJ$
ED b	x/b	3/2Fb-2Fx	$3/2Fx-2Fx^2/b$	x^2/b^2		
EF √2b	0	√2/2Fx	0	0	0	0
FG b	0	-Fx	0	0	0	0
GF b	0	Fb-Fx	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	$Fx-1/2qx^2$	0	0	0	0
EB b	0	$-1/2Fb+1/2qx^2$	0	0		
CD	elongazione asta $N_{1CD}\varepsilon_{CD}L_{CD}$				$-Fb^2/EJ$	
	totali				$-5/12Fb^2/EJ$	$5/3Xb/EJ$
	iperstatica $X=W_{CD}$				1/4Fb	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (3\ x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [3/2\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (3/2\ b -2/3\ b\ )\ Fb\ 1/EJ\ = 5/6\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (1 + x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [\ x +1/2\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b +1/2\ b -2/3\ b\ )\ Fb\ 1/EJ\ = 5/6\ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-\ x/b +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx + 1\quad (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/2\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\quad (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/2\ b +1/6\ b\ )\ Fb\ 1/EJ\ + 1\quad (-1)\ \ 1\ \ Fb^2/EJ = -4/3\ \ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2 +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx + 1\quad (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/2\ x +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\quad (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/2\ b +1/6\ b\ )\ Fb\ 1/EJ\ + 1\quad (-1)\ \ 1\ \ Fb^2/EJ = -4/3\ \ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (-1/2 +5/2\ x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [-1/2\ x +5/4\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +5/4\ b -2/3\ b\ )\ Fb\ 1/EJ\ = 1/12\ \ Fb^2/EJ$

$L^{Xo}_{ED} = \int_o^b (3/2\ x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [3/4\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (3/4\ b -2/3\ b\ )\ Fb\ 1/EJ\ = 1/12\ \ Fb^2/EJ$

PROCEDIMENTO E RISULTATI 985260 ESΣ2.xxxx.035

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ESΣ2.xxxx.035

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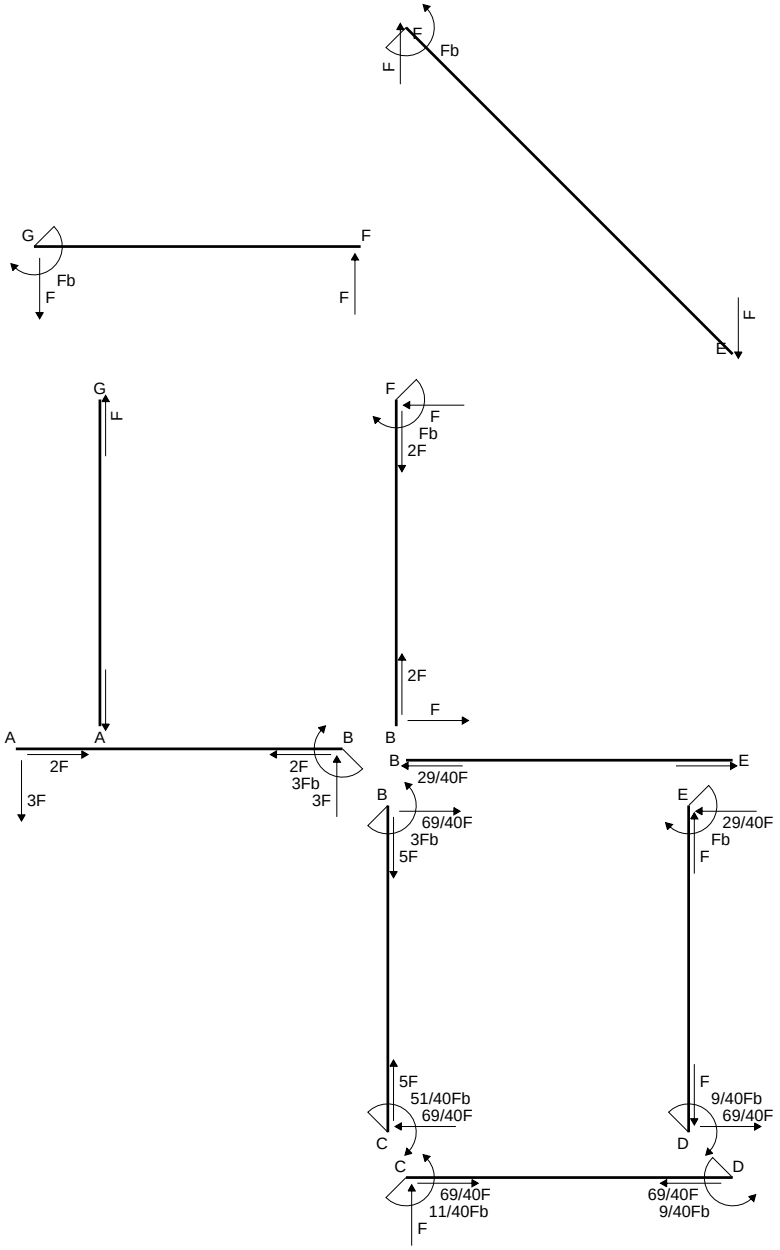
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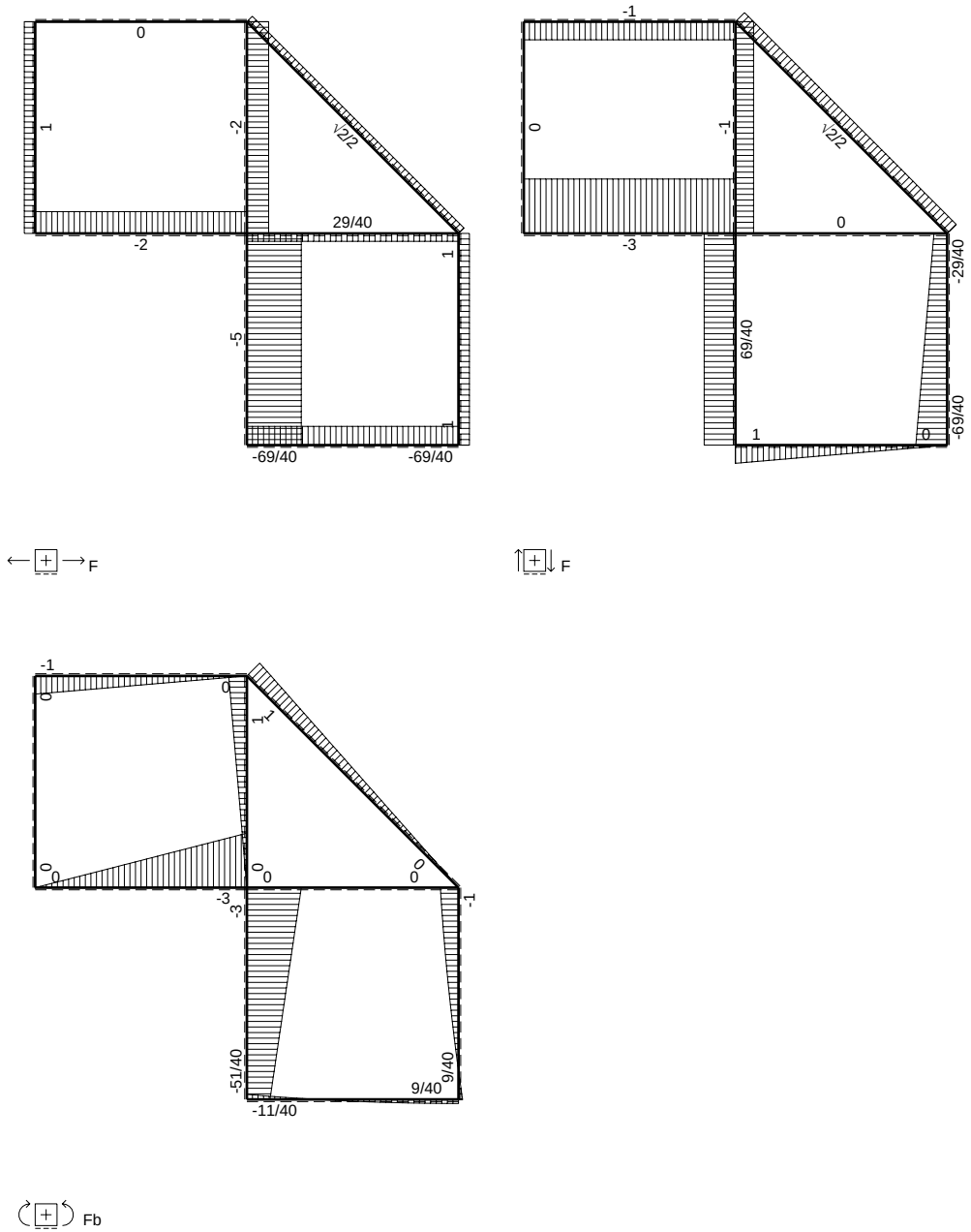
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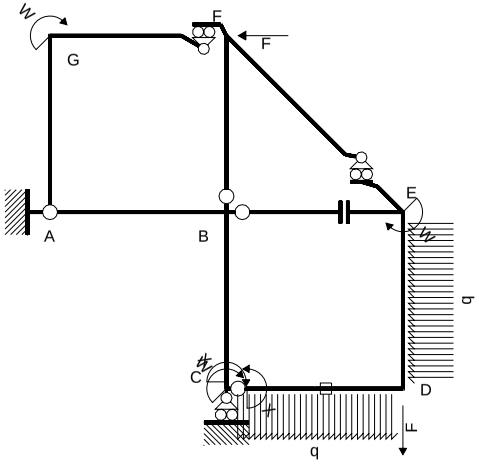
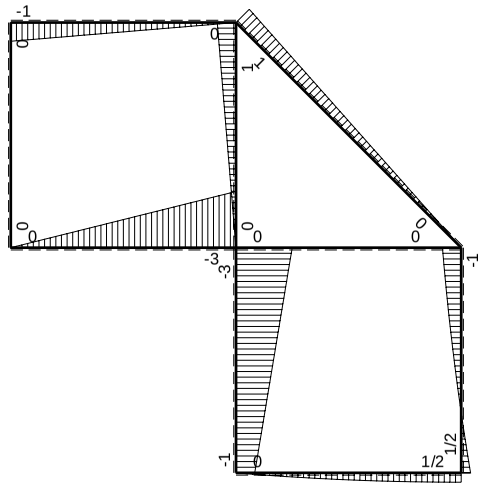
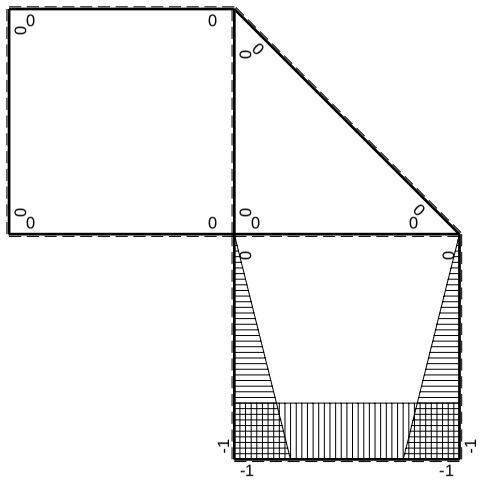


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

PROCEDIMENTO E RISULTATI 980874 ESΣ2.xxxx.046

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Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-3Fx	0	0	0	0
BA b	0	3Fb-3Fx	0	0		
BC b	-x/b	-3Fb+2Fx	$3Fx-2Fx^2/b$	x^2/b^2	$5/6Fb^2/EJ$	1/3Xb/EJ
CB b	1-x/b	Fb+2Fx	$Fb+Fx-2Fx^2/b$	$1-2x/b+x^2/b^2$		
CD b	-1	$Fx-1/2qx^2$	$-Fx+1/2Fx^2/b$	1	$-1/3Fb^2/EJ$	Xb/EJ
DC b	1	$-1/2Fb+1/2qx^2$	$-1/2Fb+1/2Fx^2/b$	1		
DE b	-1+x/b	$1/2Fb-2Fx+1/2qx^2$	$-1/2Fb+5/2Fx-5/2Fx^2/b+1/2qx^3/b$	$1-2x/b+x^2/b^2$	$1/24Fb^2/EJ$	1/3Xb/EJ
ED b	x/b	$Fb-Fx-1/2qx^2$	$Fx-Fx^2/b-1/2qx^3/b$	x^2/b^2		
EF √2b	0	√2/2Fx	0	0	0	0
FG b	0	-Fx	0	0	0	0
GF b	0	Fb-Fx	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
CD	elongazione asta $N_{1CD}\varepsilon_{CD}L_{CD}$				$-Fb^2/EJ$	
	totali				$-11/24Fb^2/EJ$	5/3Xb/EJ
	iperstatica $X=W_{CD}$				11/40Fb	

PROCEDIMENTO E RISULTATI 980874 ESΣ2.xxxx.046

Sviluppi di calcolo iperstatica

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$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1)\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b)\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1)\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b)\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (3\ x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [3/2\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (3/2\ b -2/3\ b)\ Fb\ 1/EJ\ = 5/6\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (1 + x/b -2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [\ x +1/2\ x^2/b -2/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b +1/2\ b -2/3\ b)\ Fb\ 1/EJ\ = 5/6\ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-\ x/b +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/2\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/2\ b +1/6\ b)\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = -4/3\ \ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2 +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/2\ x +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/2\ b +1/6\ b)\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = -4/3\ \ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (-1/2 +5/2\ x/b -5/2\ x^2/b^2 +1/2\ x^3/b^3)\ Fb\ 1/EJ\ dx$

$= [-1/2\ x +5/4\ x^2/b -5/6\ x^3/b^2 +1/8\ x^4/b^3\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +5/4\ b -5/6\ b +1/8\ b)\ Fb\ 1/EJ\ = 1/24\ \ Fb^2/EJ$

$L^{Xo}_{ED} = \int_o^b (x/b - x^2/b^2 -1/2\ x^3/b^3)\ Fb\ 1/EJ\ dx = [1/2\ x^2/b -1/3\ x^3/b^2 -1/8\ x^4/b^3\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/3\ b -1/8\ b)\ Fb\ 1/EJ\ = 1/24\ \ Fb^2/EJ$

PROCEDIMENTO E RISULTATI 980874 ESΣ2.xxxx.046

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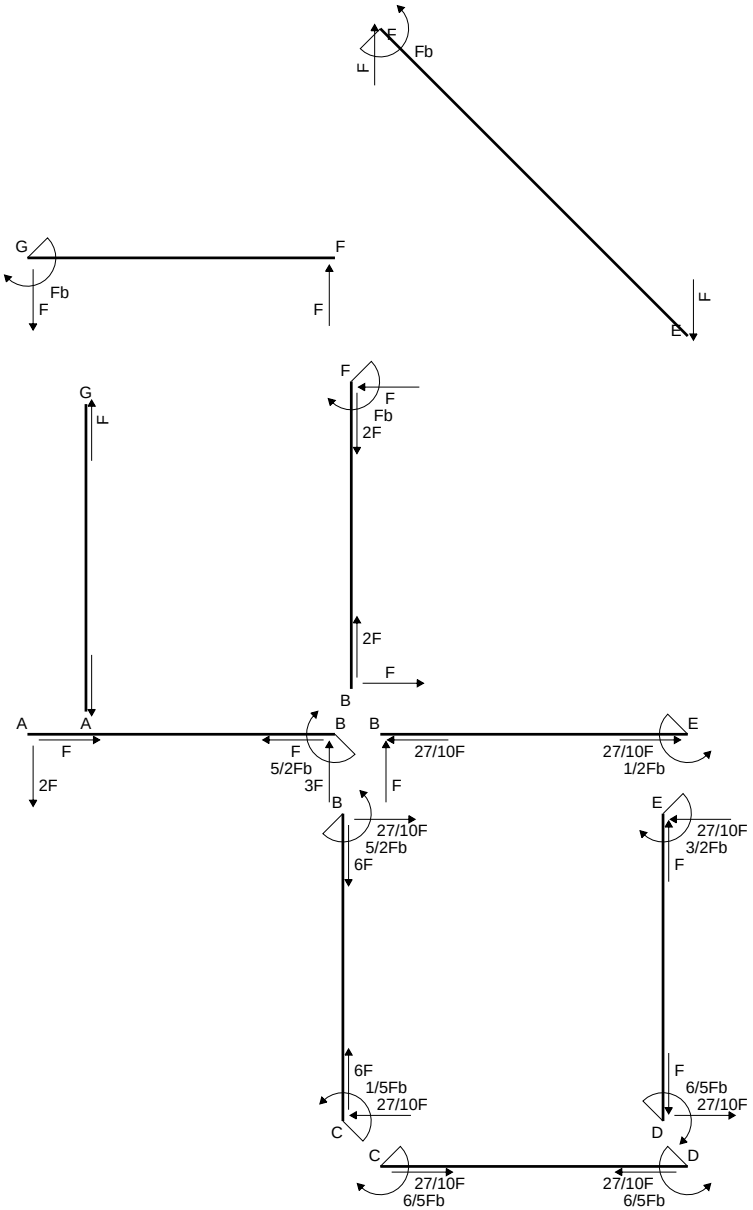
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3F
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6F
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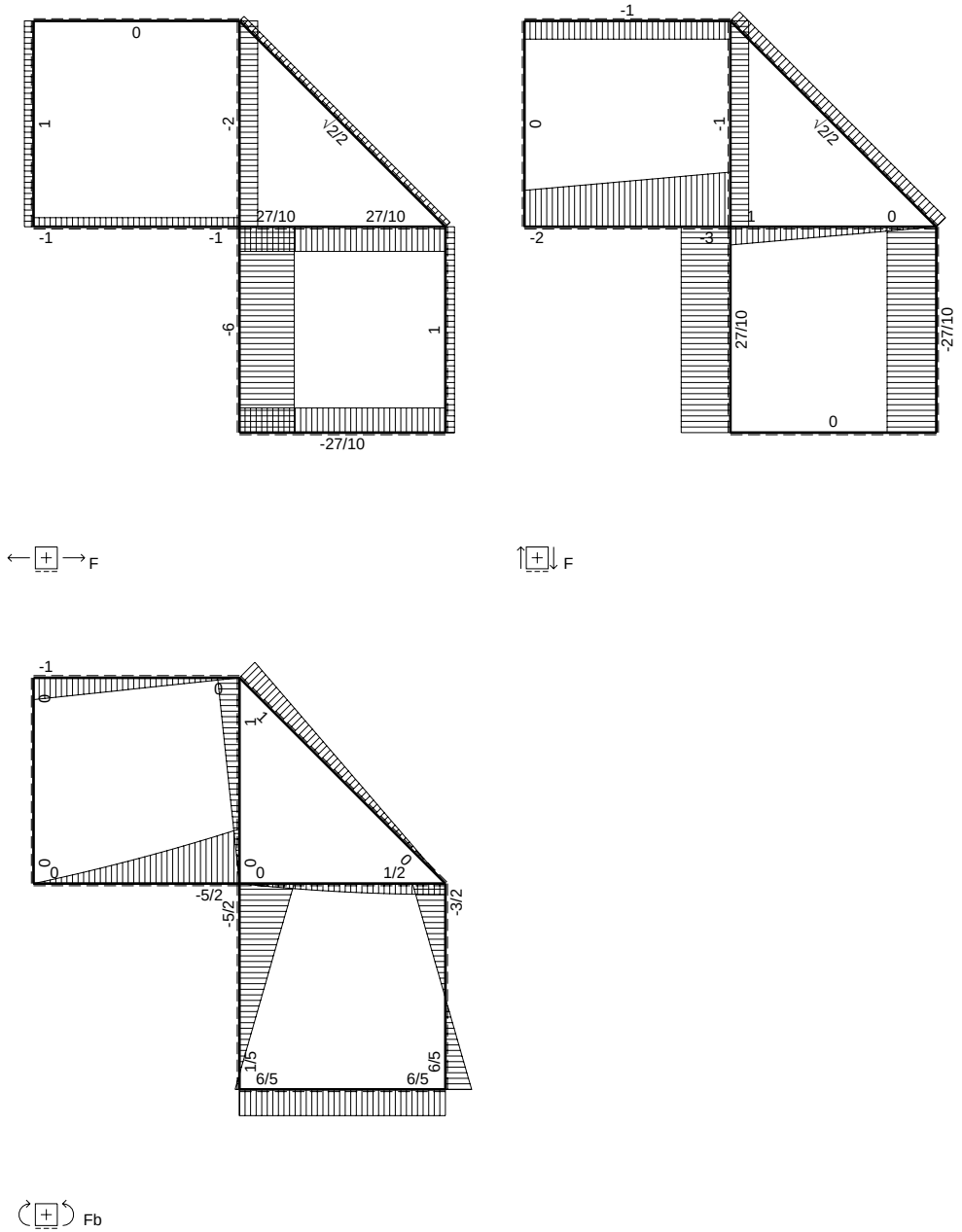
6/5Fb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F
F
-1
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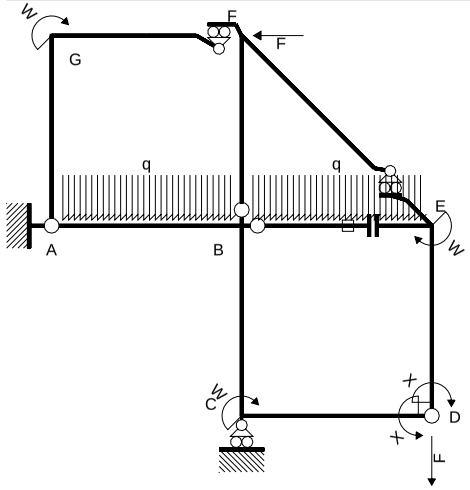
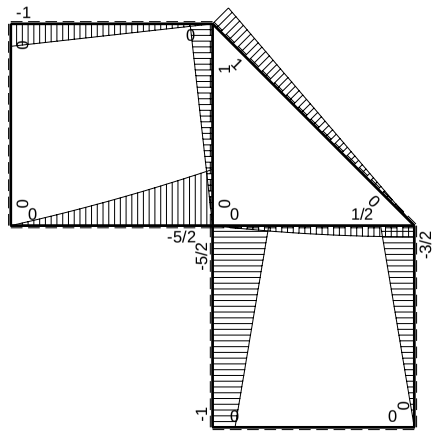
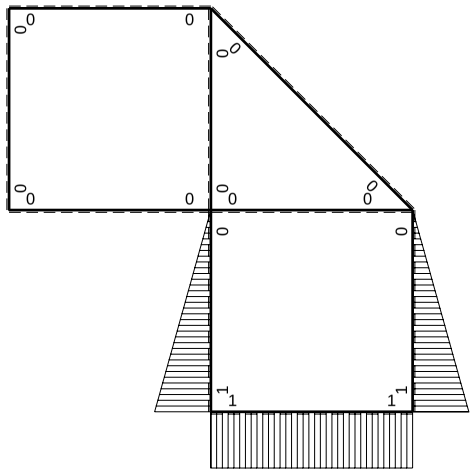
Fb





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{DC}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	$-2Fx-1/2qx^2$	0	0	0	0
BA b	0	$5/2Fb-3Fx+1/2qx^2$	0	0		
BC b	x/b	$-5/2Fb+3/2Fx$	$-5/2Fx+3/2Fx^2/b$	x^2/b^2	$-3/4Fb^2/EJ$	1/3Xb/EJ
CB b	-1+x/b	$Fb+3/2Fx$	$-Fb-1/2Fx+3/2Fx^2/b$	$1-2x/b+x^2/b^2$		
CD b	1	0	0	1	0	Xb/EJ
DC b	-1	0	0	1		
DE b	1-x/b	$-3/2Fx$	$-3/2Fx+3/2Fx^2/b$	$1-2x/b+x^2/b^2$	$-1/4Fb^2/EJ$	1/3Xb/EJ
ED b	-x/b	$3/2Fb-3/2Fx$	$-3/2Fx+3/2Fx^2/b$	x^2/b^2		
EF $\sqrt{2}$b	0	$\sqrt{2}/2Fx$	0	0	0	0
FG b	0	$-Fx$	0	0	0	0
GF b	0	$Fb-Fx$	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	$Fb-Fx$	0	0	0	0
BF b	0	$-Fx$	0	0		
BE b	0	$Fx-1/2qx^2$	0	0	0	0
EB b	0	$-1/2Fb+1/2qx^2$	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				$-Fb^2/EJ$	
	totali				$-2Fb^2/EJ$	5/3Xb/EJ
	iperstatica $X=W_{DC}$				6/5Fb	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2\ )\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (-5/2\ x/b +3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-5/4\ x^2/b +1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-5/4\ b +1/2\ b\ )\ Fb\ 1/EJ\ = -3/4\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (-1 -1/2\ x/b +3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [- x -1/4\ x^2/b +1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-\ b -1/4\ b +1/2\ b\ )\ Fb\ 1/EJ\ = -3/4\ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (-3/2\ x/b +3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-3/4\ x^2/b +1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-3/4\ b +1/2\ b\ )\ Fb\ 1/EJ\ = -1/4\ Fb^2/EJ$

$L^{Xo}_{ED} = \int_o^b (-3/2\ x/b +3/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [-3/4\ x^2/b +1/2\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-3/4\ b +1/2\ b\ )\ Fb\ 1/EJ\ = -1/4\ Fb^2/EJ$

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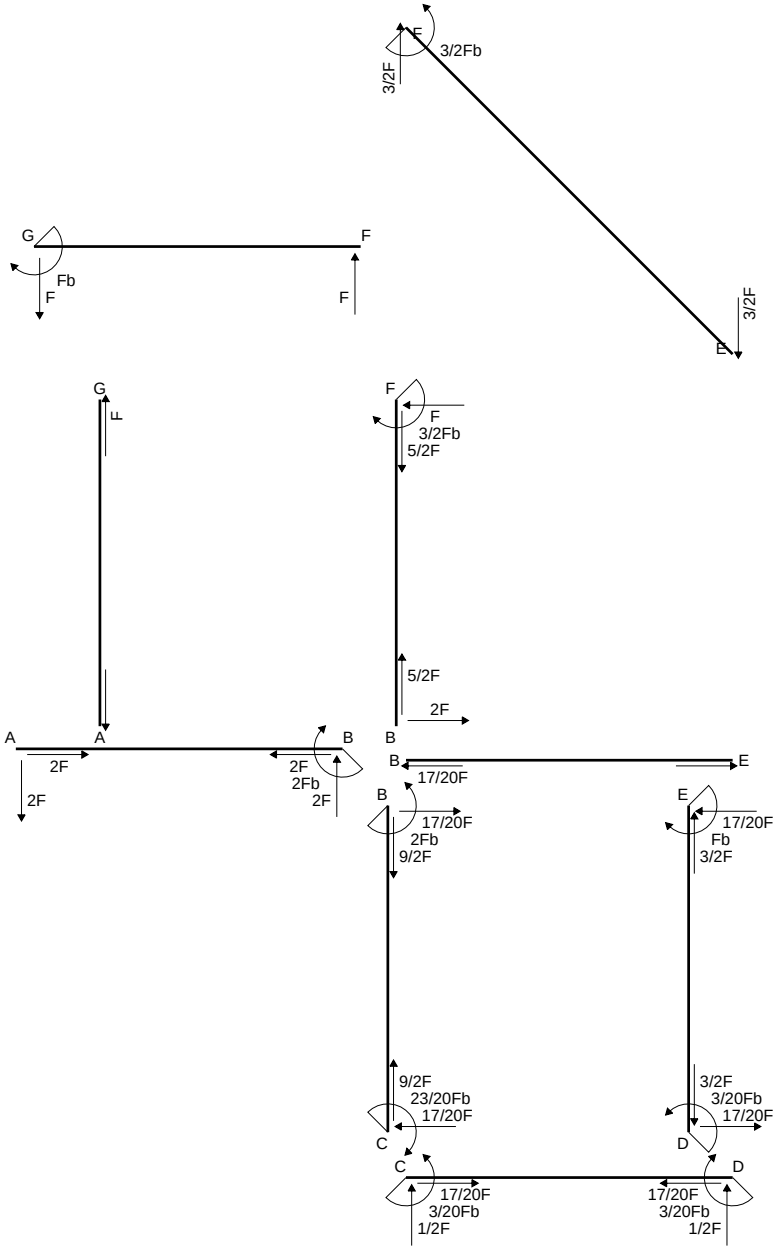
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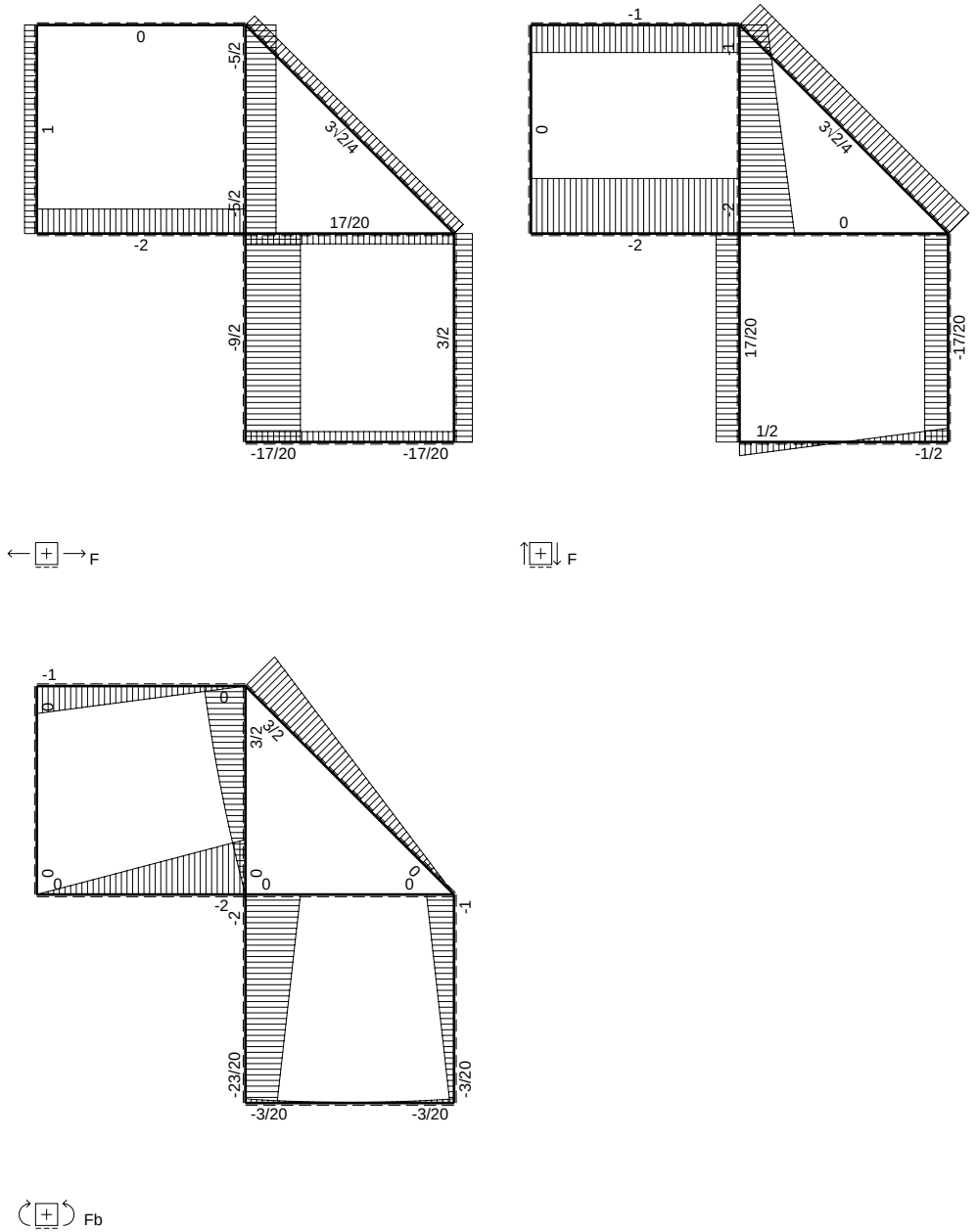
1/2F
17/20F
3/20Fb
1/2F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3√2/4
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0
-2
17/20
-17/20
1/2
-1/2
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F
-1
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-1
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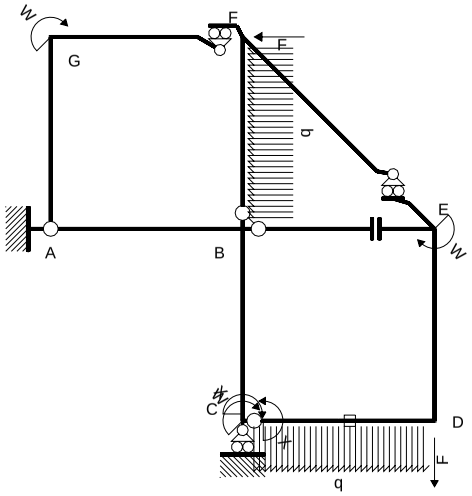
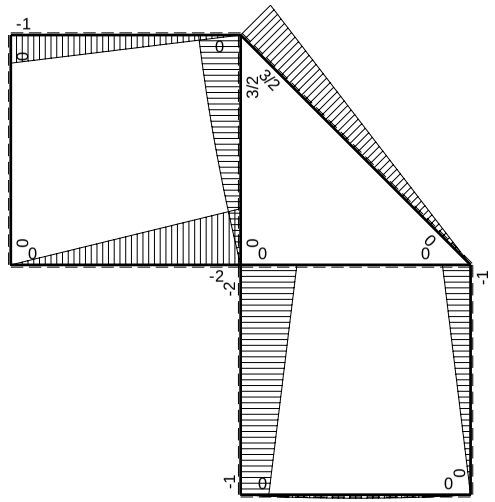
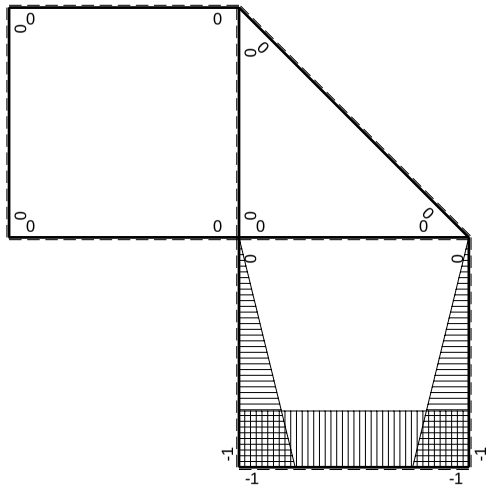
-3/20
Fb



Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_0(x)$	M_xM_0	M_xM_x	$\int M_xM_0/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-2Fx	0	0	0	0
BA b	0	2Fb-2Fx	0	0		
BC b	-x/b	-2Fb+Fx	2Fx-Fx^2/b	x^2/b^2	2/3Fb^2/EJ	1/3Xb/EJ
CB b	1-x/b	Fb+Fx	Fb-Fx^2/b	1-2x/b+x^2/b^2		
CD b	-1	1/2Fx-1/2qx^2	-1/2Fx+1/2Fx^2/b	1	-1/12Fb^2/EJ	Xb/EJ
DC b	1	-1/2Fx+1/2qx^2	-1/2Fx+1/2Fx^2/b	1		
DE b	-1+x/b	-Fx	Fx-Fx^2/b	1-2x/b+x^2/b^2	1/6Fb^2/EJ	1/3Xb/EJ
ED b	x/b	Fb-Fx	Fx-Fx^2/b	x^2/b^2		
EF √2b	0	3√2/4Fx	0	0	0	0
FG b	0	-Fx	0	0	0	0
GF b	0	Fb-Fx	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	3/2Fb-Fx-1/2qx^2	0	0	0	0
BF b	0	-2Fx+1/2qx^2	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
CD	elongazione asta $N_{1CD}\varepsilon_{CD}L_{CD}$				-Fb^2/EJ	
	totali				-1/4Fb^2/EJ	5/3Xb/EJ
	iperstatica $X=W_{CD}$				3/20Fb	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (2\ x/b - x^2/b^2)\ Fb\ 1/EJ\ dx = [\ x^2/b -1/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b -1/3\ b\ )\ Fb\ 1/EJ\ = 2/3\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (1 - x^2/b^2\ )\ Fb\ 1/EJ\ dx = [\ x -1/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b -1/3\ b\ )\ Fb\ 1/EJ\ = 2/3\ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-1/2\ x/b +1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/4\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/4\ b +1/6\ b\ )\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = -13/12\ \ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2\ x/b +1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/4\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/4\ b +1/6\ b\ )\ Fb\ 1/EJ\ + 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = -13/12\ \ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (\ x/b - x^2/b^2\ )\ Fb\ 1/EJ\ dx = [1/2\ x^2/b -1/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/3\ b\ )\ Fb\ 1/EJ\ = 1/6\ \ Fb^2/EJ$

$L^{Xo}_{ED} = \int_o^b (\ x/b - x^2/b^2\ )\ Fb\ 1/EJ\ dx = [1/2\ x^2/b -1/3\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/3\ b\ )\ Fb\ 1/EJ\ = 1/6\ \ Fb^2/EJ$

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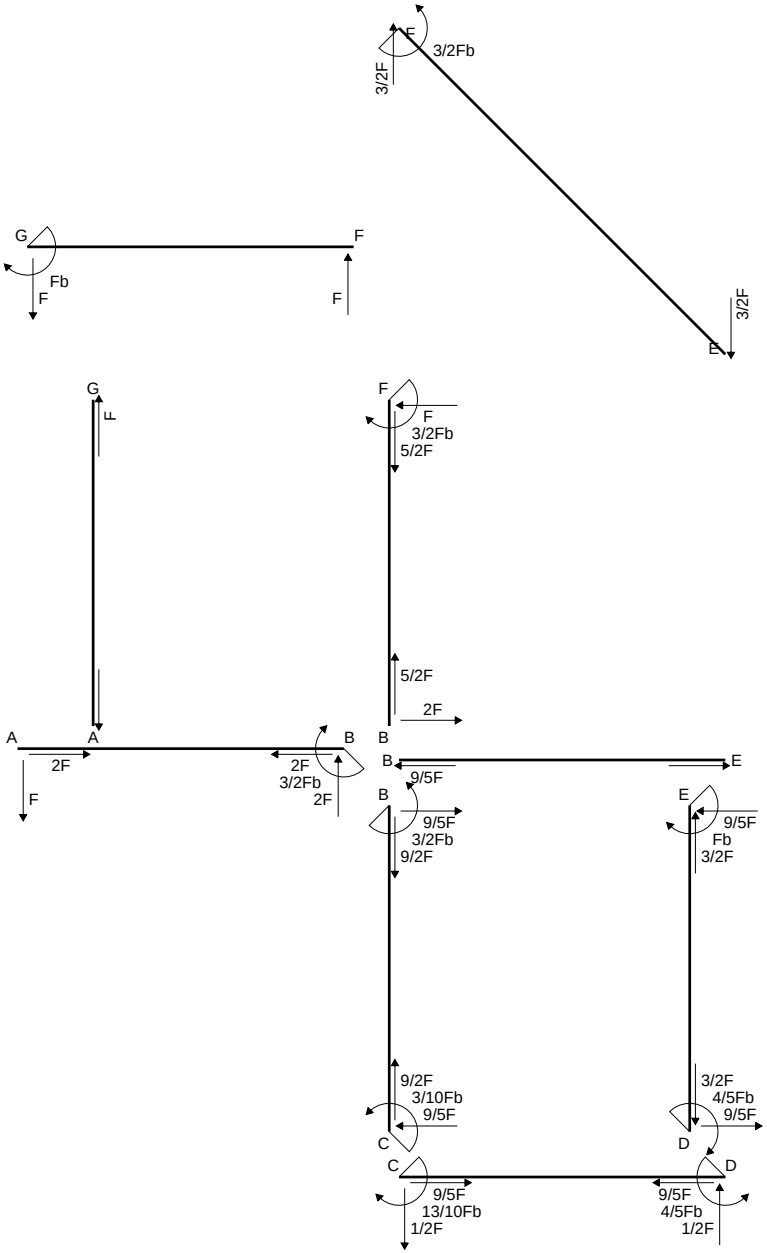
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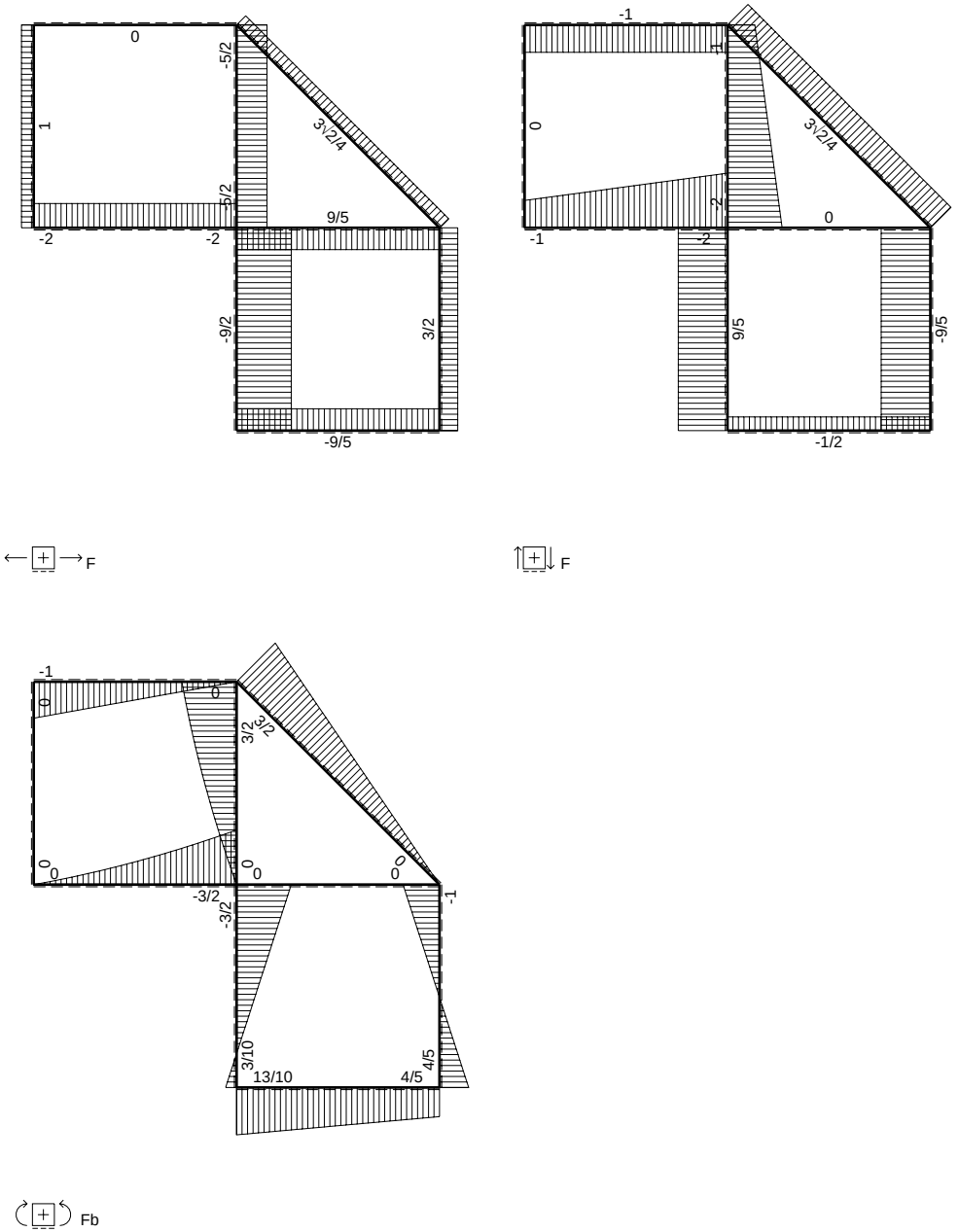
1/2F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1
0
3√2/4
2
-2
0
-1
9/5
-9/5
-1/2
F
F
-1
1
0
0
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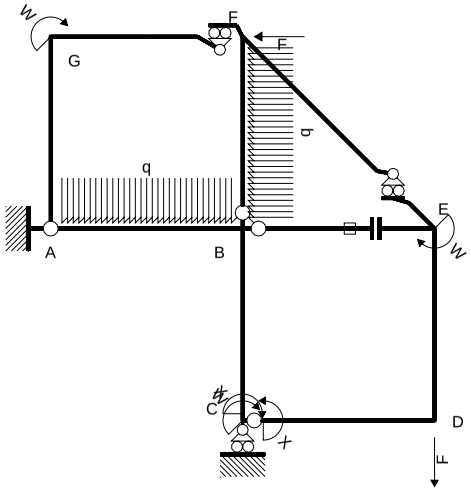
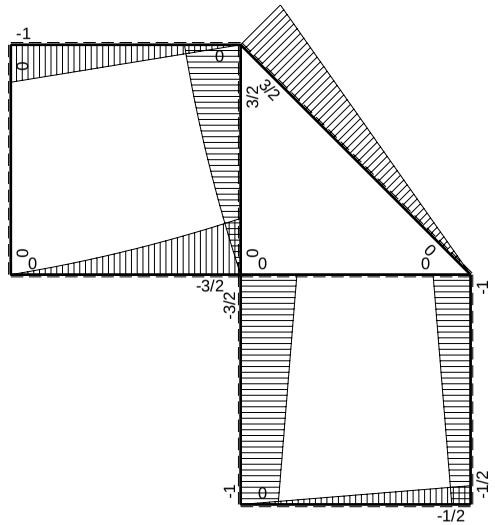
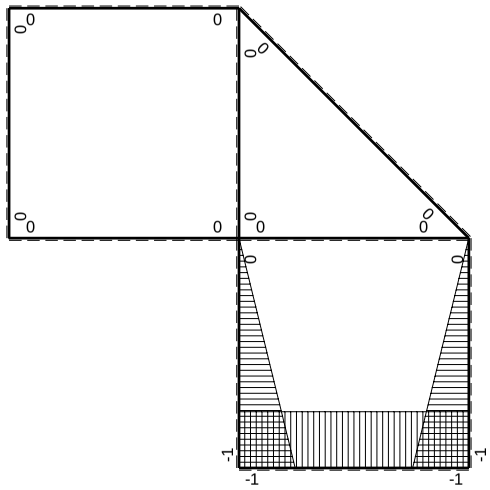
4/5
4/5
Fb



Schema di calcolo iperstatico



M_o flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	$-Fx-1/2qx^2$	0	0	0	0
BA b	0	$3/2Fb-2Fx+1/2qx^2$	0	0		
BC b	-x/b	$-3/2Fb+1/2Fx$	$3/2Fx-1/2Fx^2/b$	x^2/b^2	$7/12Fb^2/EJ$	1/3Xb/EJ
CB b	1-x/b	$Fb+1/2Fx$	$Fb-1/2Fx-1/2Fx^2/b$	$1-2x/b+x^2/b^2$		
CD b	-1	$-1/2Fx$	$1/2Fx$	1	$1/4Fb^2/EJ$	Xb/EJ
DC b	1	$1/2Fb-1/2Fx$	$1/2Fb-1/2Fx$	1		
DE b	-1+x/b	$-1/2Fb-1/2Fx$	$1/2Fb-1/2Fx^2/b$	$1-2x/b+x^2/b^2$	$1/3Fb^2/EJ$	1/3Xb/EJ
ED b	x/b	$Fb-1/2Fx$	$Fx-1/2Fx^2/b$	x^2/b^2		
EF $\sqrt{2}$b	0	$3\sqrt{2}/4Fx$	0	0	0	0
FG b	0	-Fx	0	0	0	0
GF b	0	Fb-Fx	0	0		
GA b	0	0	0	0	0	0
AG b	0	0	0	0		
FB b	0	$3/2Fb-Fx-1/2qx^2$	0	0	0	0
BF b	0	$-2Fx+1/2qx^2$	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^2/EJ	
	totali				$13/6Fb^2/EJ$	5/3Xb/EJ
	iperstatica $X=W_{CD}$				-13/10Fb	

Sviluppi di calcolo iperstatica

$L_{BC}^{XX} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L_{CB}^{XX} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L_{CD}^{XX} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L_{DC}^{XX} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L_{DE}^{XX} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L_{ED}^{XX} = \int_o^b (x^2/b^2\ )\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L_{BC}^{Xo} = \int_o^b (3/2\ x/b -1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [3/4\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (3/4\ b -1/6\ b\ )\ Fb\ 1/EJ\ = 7/12\ Fb^2/EJ$

$L_{CB}^{Xo} = \int_o^b (1 -1/2\ x/b -1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [\ x -1/4\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b -1/4\ b -1/6\ b\ )\ Fb\ 1/EJ\ = 7/12\ Fb^2/EJ$

$L_{CD}^{Xo} = \int_o^b (1/2\ x/b\ )\ Fb\ 1/EJ\ dx = [1/4\ x^2/b\ ]_o^b\ Fb\ 1/EJ$

$= (1/4\ b\ )\ Fb\ 1/EJ\ = 1/4\ Fb^2/EJ$

$L_{DC}^{Xo} = \int_o^b (1/2 -1/2\ x/b\ )\ Fb\ 1/EJ\ dx = [1/2\ x -1/4\ x^2/b\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/4\ b\ )\ Fb\ 1/EJ\ = 1/4\ Fb^2/EJ$

$L_{DE}^{Xo} = \int_o^b (1/2 -1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [1/2\ x -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/6\ b\ )\ Fb\ 1/EJ\ = 1/3\ Fb^2/EJ$

$L_{ED}^{Xo} = \int_o^b (\ x/b -1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx = [1/2\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (1/2\ b -1/6\ b\ )\ Fb\ 1/EJ\ = 1/3\ Fb^2/EJ$

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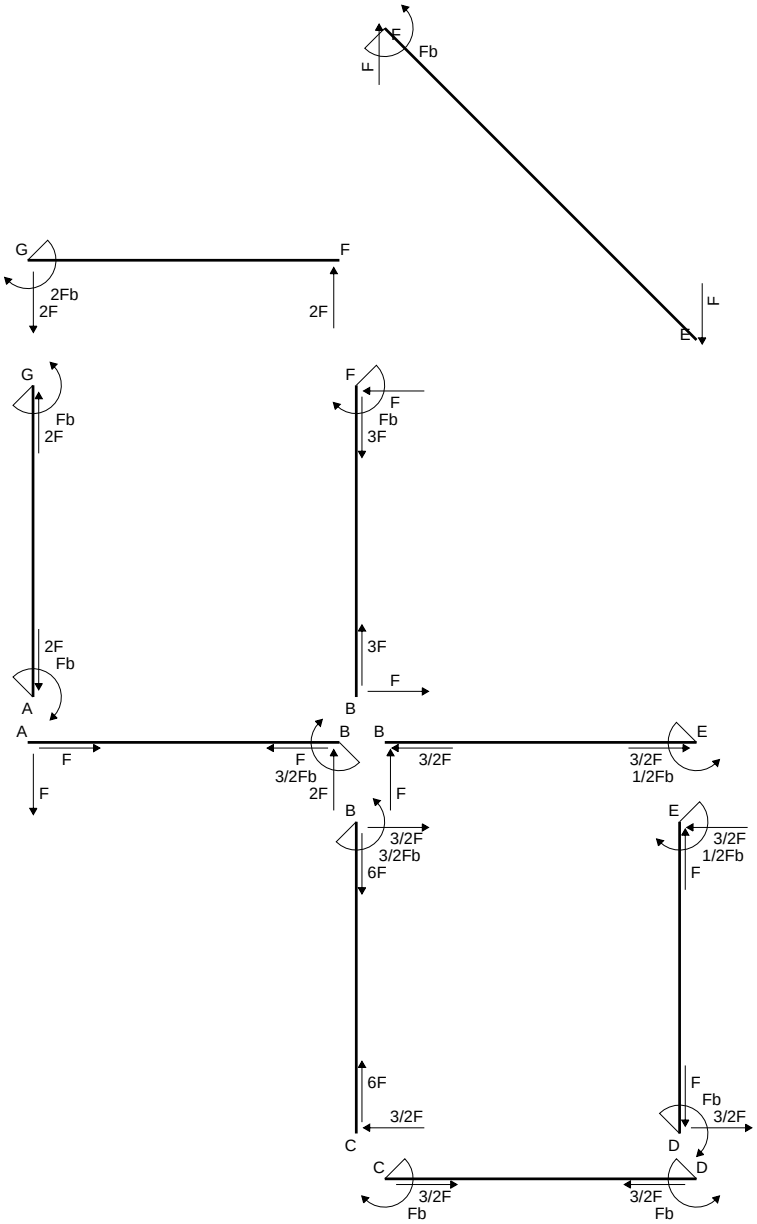
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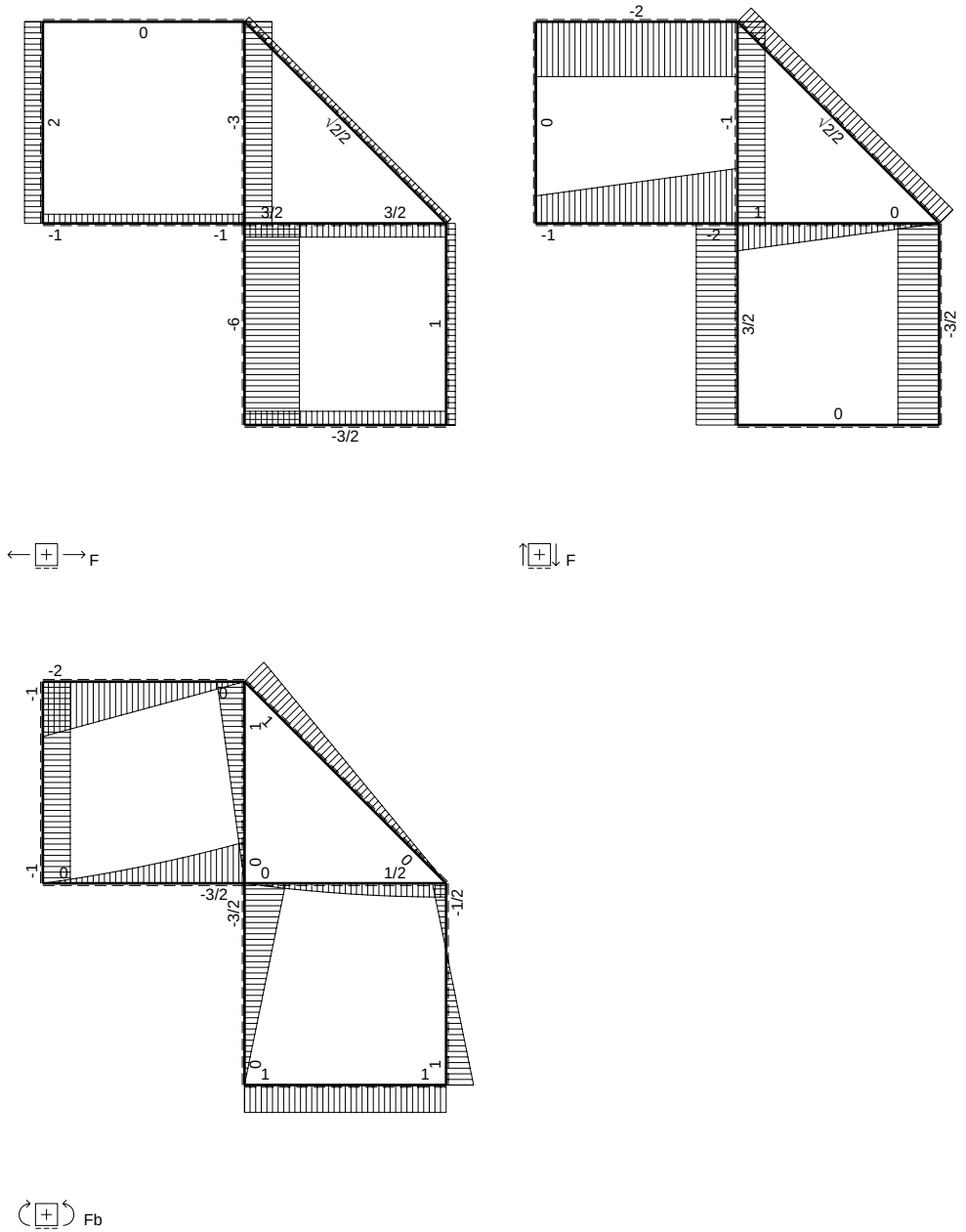
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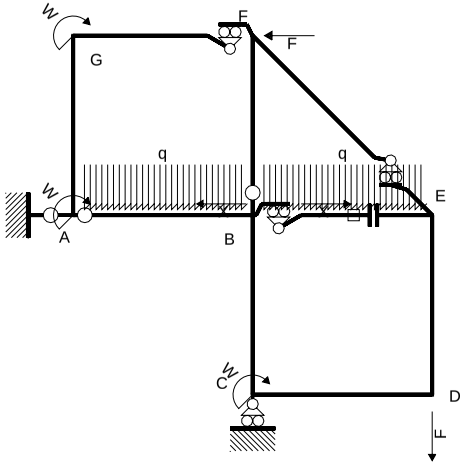
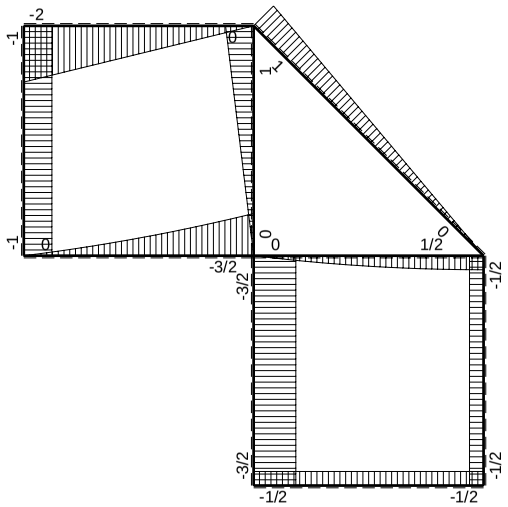
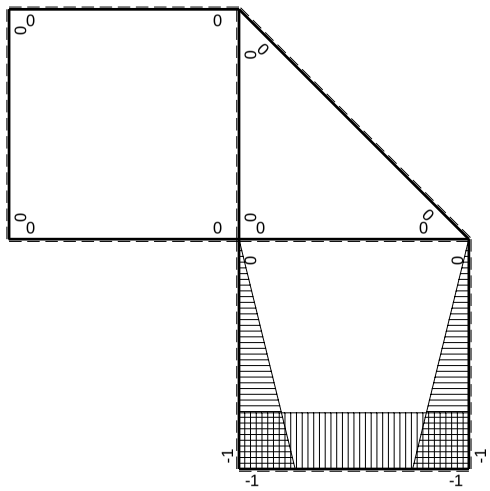


Schema di calcolo iperstatico



M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=H_{BE}$

→	$M_x(x)$	$M_0(x)$	M_xM_0	M_xM_x	$\int M_xM_0/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	$-Fx-1/2qx^2$	0	0	0	0
BA b	0	$3/2Fb-2Fx+1/2qx^2$	0	0		
BC b	-x	-3/2Fb	3/2Fbx	x^2	$3/4Fb^3/EJ$	$1/3Xb^3/EJ$
CB b	b-x	3/2Fb	$3/2Fb^2-3/2Fbx$	$b^2-2bx+x^2$		
CD b	-b	-1/2Fb	$1/2Fb^2$	b^2	$1/2Fb^3/EJ$	Xb^3/EJ
DC b	b	1/2Fb	$1/2Fb^2$	b^2		
DE b	-b+x	-1/2Fb	$1/2Fb^2-1/2Fbx$	$b^2-2bx+x^2$	$1/4Fb^3/EJ$	$1/3Xb^3/EJ$
ED b	x	1/2Fb	1/2Fbx	x^2		
EF √2b	0	√2/2Fx	0	0	0	0
FG b	0	-2Fx	0	0	0	0
GF b	0	2Fb-2Fx	0	0		
GA b	0	-Fb	0	0	0	0
AG b	0	Fb	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	$Fx-1/2qx^2$	0	0	0	0
EB b	0	$-1/2Fb+1/2qx^2$	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^3/EJ	
	totali				$5/2Fb^3/EJ$	$5/3Xb^3/EJ$
	iperstatica $X=H_{BE}$				-3/2F	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2) b^2\ 1/EJ\ dx = [1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ b^2\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (\ b - b +1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{CD} = \int_o^b (1)\ b^2\ 1/EJ\ dx = [\ x\ ]_o^b\ b^2\ 1/EJ$

$= (\ b)\ b^2\ 1/EJ\ = \ b^3/EJ$

$L^{XX}_{DC} = \int_o^b (1)\ b^2\ 1/EJ\ dx = [\ x\ ]_o^b\ b^2\ 1/EJ$

$= (\ b)\ b^2\ 1/EJ\ = \ b^3/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ b^2\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (\ b - b +1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ b^2\ 1/EJ\ dx = [1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{Xo}_{BC} = \int_o^b (3/2\ x/b)\ Fb^2\ 1/EJ\ dx = [3/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (3/4\ b)\ Fb^2\ 1/EJ\ = 3/4\ \ Fb^3/EJ$

$L^{Xo}_{CB} = \int_o^b (3/2 -3/2\ x/b)\ Fb^2\ 1/EJ\ dx = [3/2\ x -3/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (3/2\ b -3/4\ b)\ Fb^2\ 1/EJ\ = 3/4\ \ Fb^3/EJ$

$L^{Xo}_{CD} = \int_o^b (1/2)\ Fb^2\ 1/EJ\ dx = [1/2\ x]_o^b\ Fb^2\ 1/EJ$

$= (1/2\ b)\ Fb^2\ 1/EJ\ = 1/2\ \ Fb^3/EJ$

$L^{Xo}_{DC} = \int_o^b (1/2)\ Fb^2\ 1/EJ\ dx = [1/2\ x]_o^b\ Fb^2\ 1/EJ$

$= (1/2\ b)\ Fb^2\ 1/EJ\ = 1/2\ \ Fb^3/EJ$

$L^{Xo}_{DE} = \int_o^b (1/2 -1/2\ x/b)\ Fb^2\ 1/EJ\ dx = [1/2\ x -1/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (1/2\ b -1/4\ b)\ Fb^2\ 1/EJ\ = 1/4\ \ Fb^3/EJ$

$L^{Xo}_{ED} = \int_o^b (1/2\ x/b)\ Fb^2\ 1/EJ\ dx = [1/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (1/4\ b)\ Fb^2\ 1/EJ\ = 1/4\ \ Fb^3/EJ$

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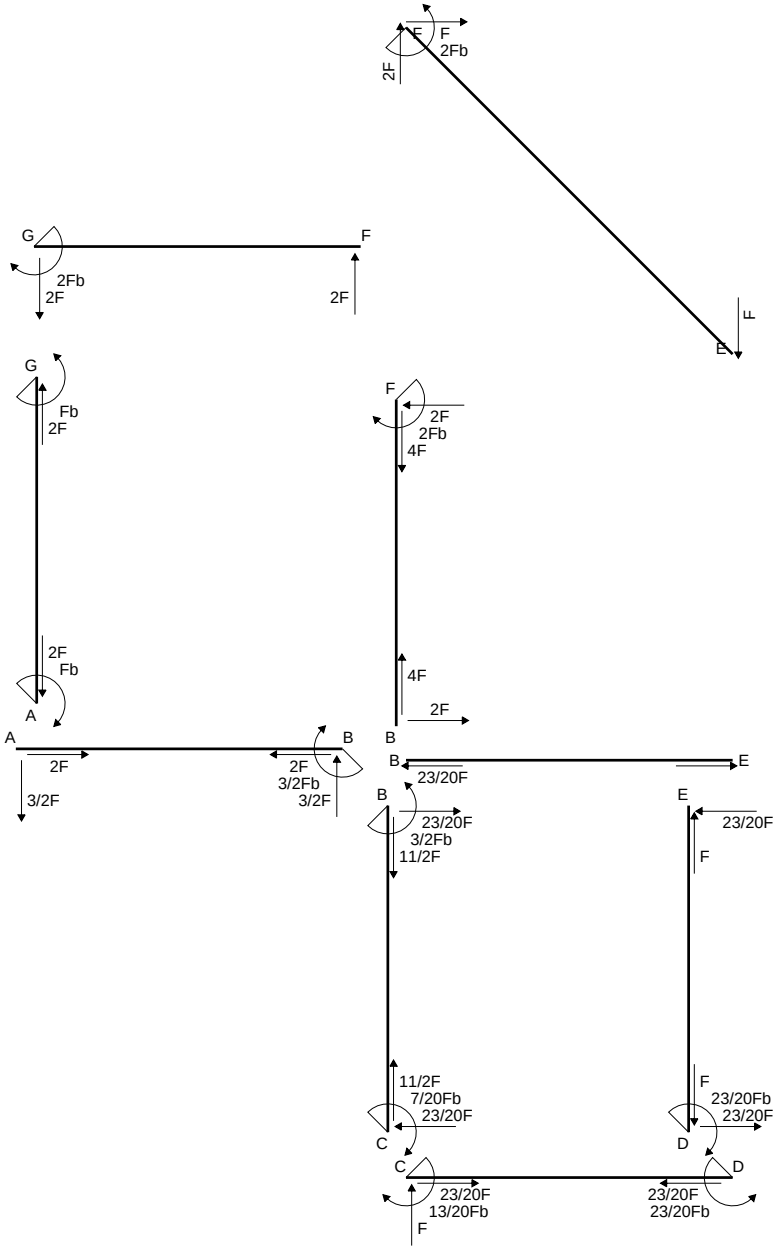
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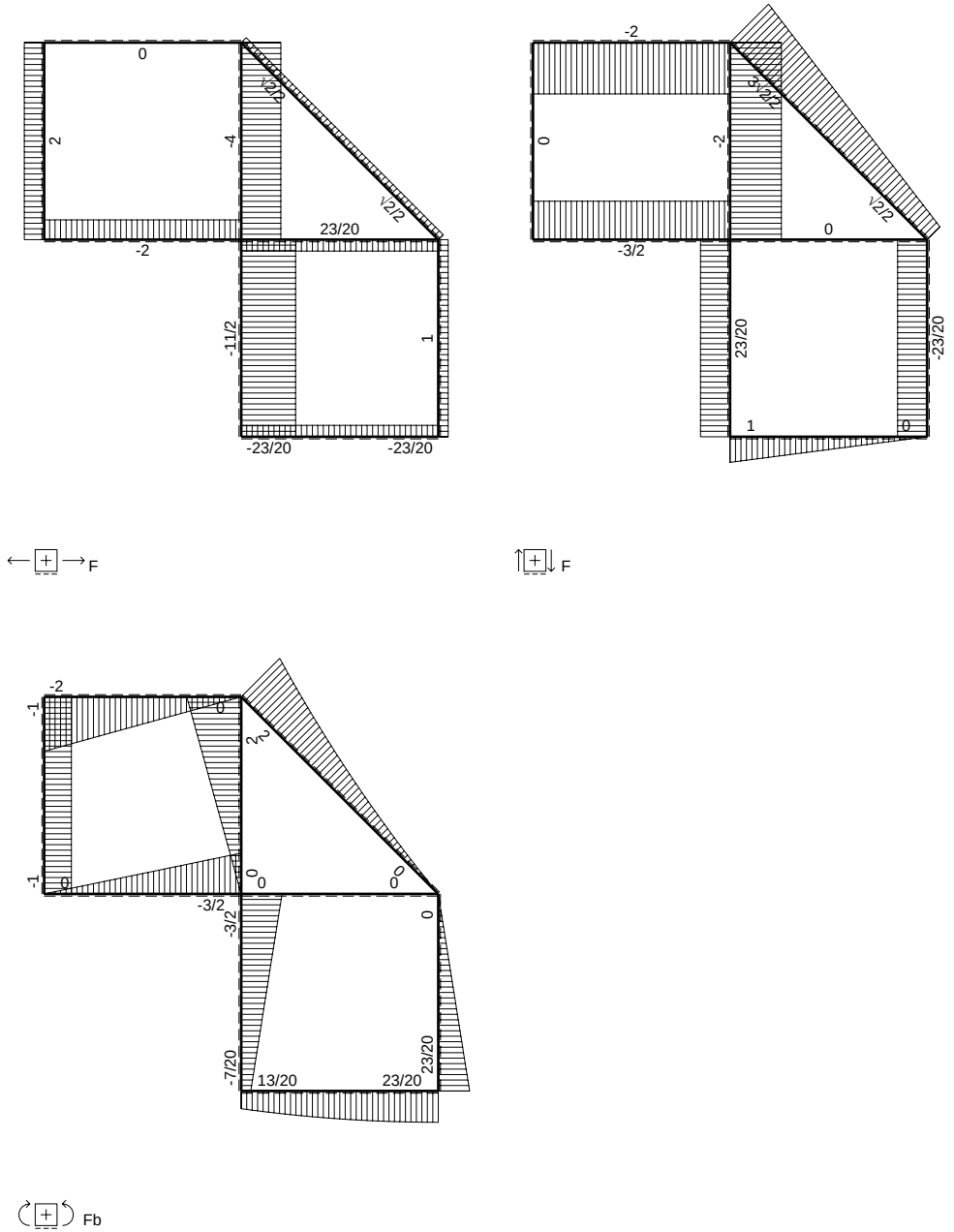
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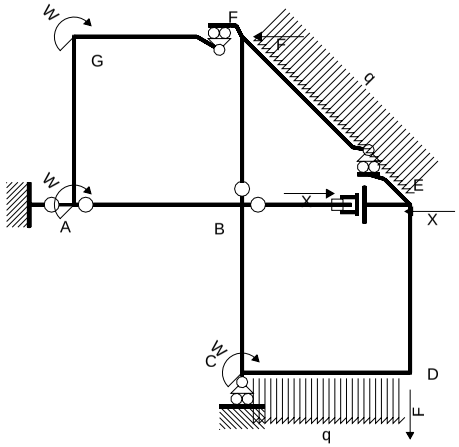
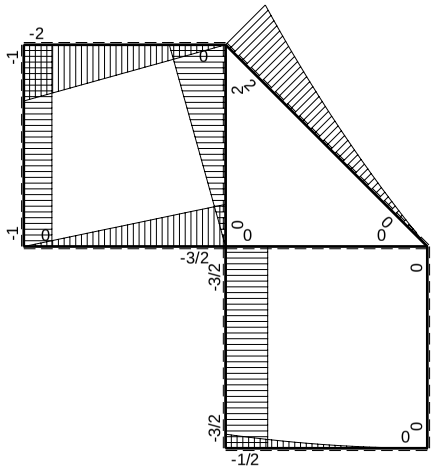
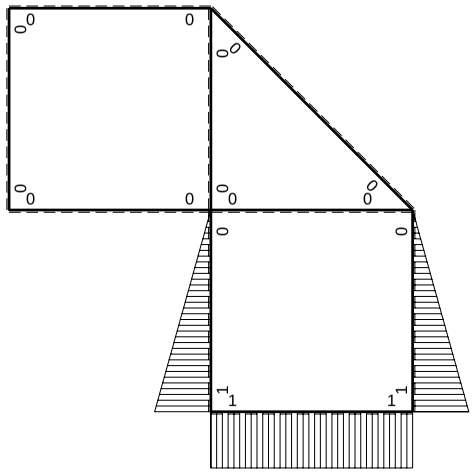




M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=H_{EB}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-3/2Fx	0	0	0	0
BA b	0	3/2Fb-3/2Fx	0	0		
BC b	x	-3/2Fb	-3/2Fbx	x^2	$-3/4Fb^3/EJ$	$1/3Xb^3/EJ$
CB b	-b+x	3/2Fb	$-3/2Fb^2+3/2Fbx$	$b^2-2bx+x^2$		
CD b	b	$-1/2Fb+Fx-1/2qx^2$	$-1/2Fb^2+Fbx-1/2Fx^2$	b^2	$-1/6Fb^3/EJ$	Xb^3/EJ
DC b	-b	$1/2qx^2$	$-1/2Fx^2$	b^2		
DE b	b-x	0	0	$b^2-2bx+x^2$	0	$1/3Xb^3/EJ$
ED b	-x	0	0	x^2		
EF $\sqrt{2}$b	0	$\sqrt{2}/2Fx+1/2qx^2$	0	0	0	0
FG b	0	-2Fx	0	0	0	0
GF b	0	2Fb-2Fx	0	0		
GA b	0	-Fb	0	0	0	0
AG b	0	Fb	0	0		
FB b	0	2Fb-2Fx	0	0	0	0
BF b	0	-2Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				$-Fb^3/EJ$	
	totali				$-23/12Fb^3/EJ$	$5/3Xb^3/EJ$
	iperstatica $X=H_{EB}$				23/20F	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2) b^2\ 1/EJ\ dx = [1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ b^2\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (\ b - b +1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{CD} = \int_o^b (1)\ b^2\ 1/EJ\ dx = [\ x\ ]_o^b\ b^2\ 1/EJ$

$= (\ b)\ b^2\ 1/EJ\ =\ \ b^3/EJ$

$L^{XX}_{DC} = \int_o^b (1)\ b^2\ 1/EJ\ dx = [\ x\ ]_o^b\ b^2\ 1/EJ$

$= (\ b)\ b^2\ 1/EJ\ =\ \ b^3/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ b^2\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (\ b - b +1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ b^2\ 1/EJ\ dx = [1/3\ x^3/b^2]_o^b\ b^2\ 1/EJ$

$= (1/3\ b)\ b^2\ 1/EJ\ = 1/3\ \ b^3/EJ$

$L^{Xo}_{BC} = \int_o^b (-3/2\ x/b)\ Fb^2\ 1/EJ\ dx = [-3/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (-3/4\ b)\ Fb^2\ 1/EJ\ = -3/4\ \ Fb^3/EJ$

$L^{Xo}_{CB} = \int_o^b (-3/2 +3/2\ x/b)\ Fb^2\ 1/EJ\ dx = [-3/2\ x +3/4\ x^2/b]_o^b\ Fb^2\ 1/EJ$

$= (-3/2\ b +3/4\ b)\ Fb^2\ 1/EJ\ = -3/4\ \ Fb^3/EJ$

$L^{Xo}_{CD} = \int_o^b (-1/2 + x/b -1/2\ x^2/b^2)\ Fb^2\ 1/EJ\ dx = [-1/2\ x +1/2\ x^2/b -1/6\ x^3/b^2]_o^b\ Fb^2\ 1/EJ$

$= (-1/2\ b +1/2\ b -1/6\ b)\ Fb^2\ 1/EJ\ = -1/6\ \ Fb^3/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2\ x^2/b^2)\ Fb^2\ 1/EJ\ dx = [-1/6\ x^3/b^2]_o^b\ Fb^2\ 1/EJ$

$= (-1/6\ b)\ Fb^2\ 1/EJ\ = -1/6\ \ Fb^3/EJ$

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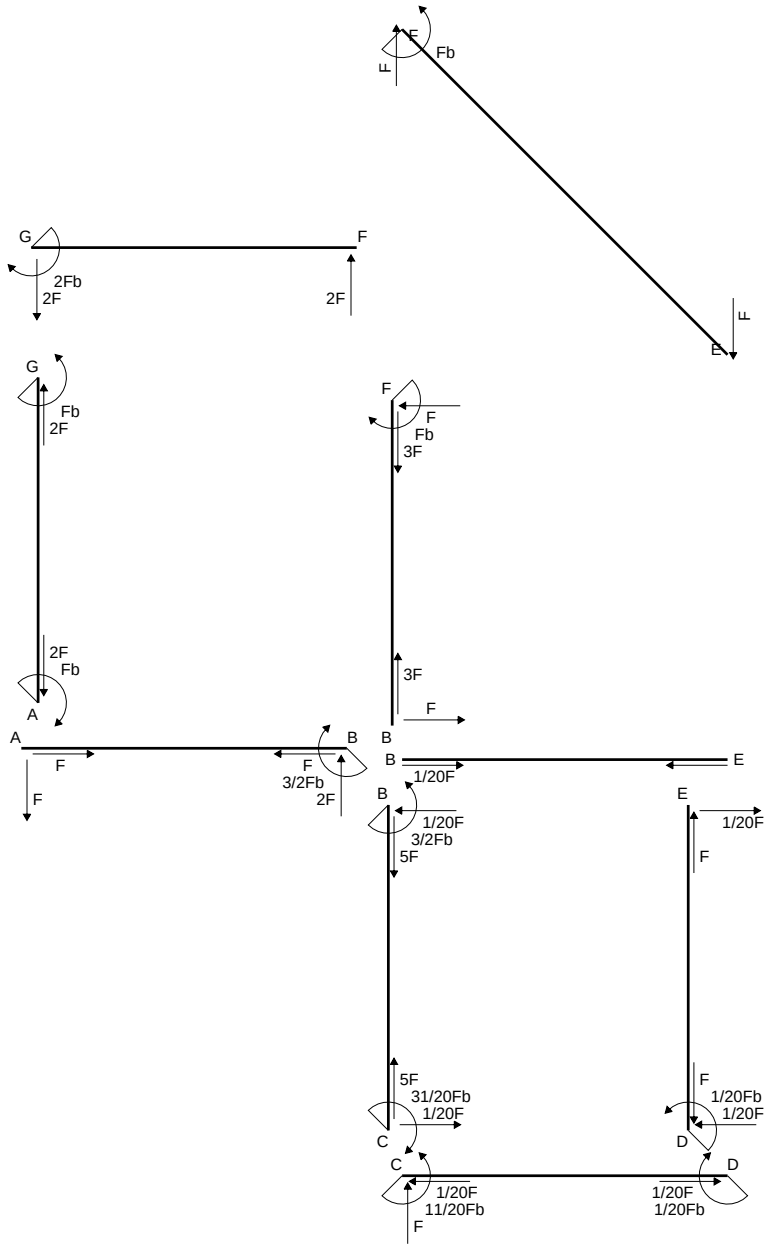
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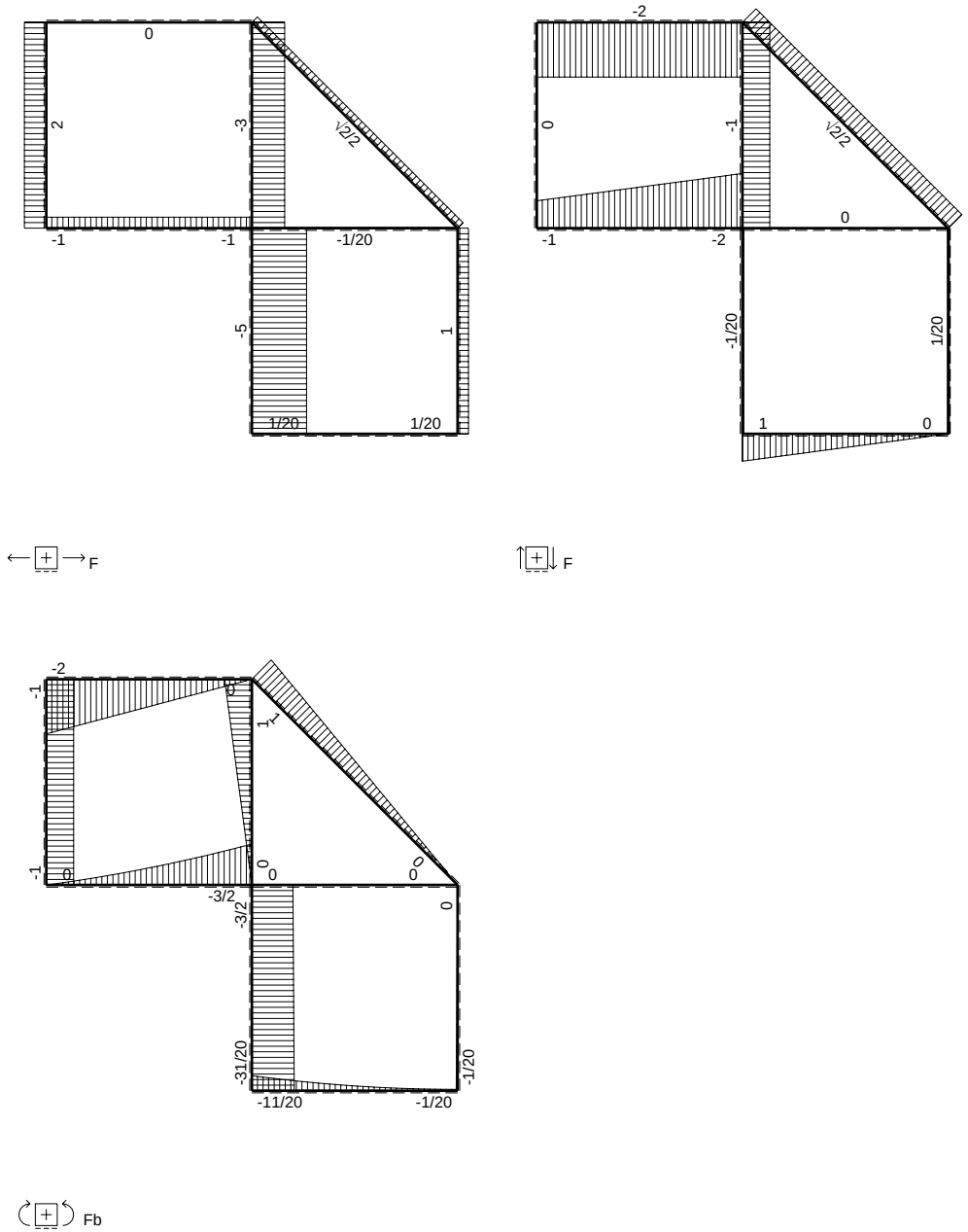
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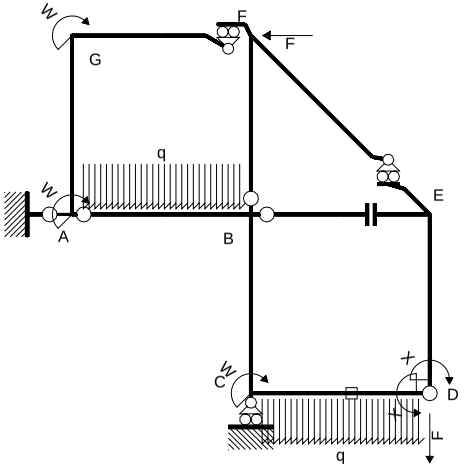
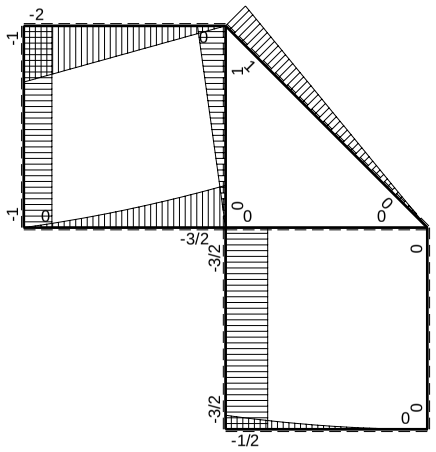
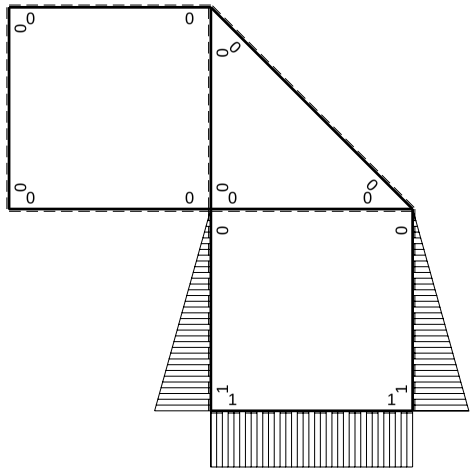




M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{DC}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	$-Fx-1/2qx^2$	0	0	0	0
BA b	0	$3/2Fb-2Fx+1/2qx^2$	0	0		
BC b	x/b	-3/2Fb	-3/2Fx	x^2/b^2	$-3/4Fb^2/EJ$	$1/3Xb/EJ$
CB b	-1+x/b	3/2Fb	$-3/2Fb+3/2Fx$	$1-2x/b+x^2/b^2$		
CD b	1	$-1/2Fb+Fx-1/2qx^2$	$-1/2Fb+Fx-1/2Fx^2/b$	1	$-1/6Fb^2/EJ$	Xb/EJ
DC b	-1	$1/2qx^2$	$-1/2Fx^2/b$	1		
DE b	1-x/b	0	0	$1-2x/b+x^2/b^2$	0	$1/3Xb/EJ$
ED b	-x/b	0	0	x^2/b^2		
EF $\sqrt{2}b$	0	$\sqrt{2}/2Fx$	0	0	0	0
FG b	0	-2Fx	0	0	0	0
GF b	0	2Fb-2Fx	0	0		
GA b	0	-Fb	0	0	0	0
AG b	0	Fb	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
CD	elongazione asta $N_{1CD}\varepsilon_{CD}L_{CD}$				Fb^2/EJ	
	totali				$1/12Fb^2/EJ$	$5/3Xb/EJ$
	iperstatica $X=W_{DC}$				-1/20Fb	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1\ )\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b\ )\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2\ )\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2\ )\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b\ )\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (-3/2\ x/b\ )\ Fb\ 1/EJ\ dx = [-3/4\ x^2/b\ ]_o^b\ Fb\ 1/EJ$

$= (-3/4\ b\ )\ Fb\ 1/EJ\ = -3/4\ \ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (-3/2 +3/2\ x/b\ )\ Fb\ 1/EJ\ dx = [-3/2\ x +3/4\ x^2/b\ ]_o^b\ Fb\ 1/EJ$

$= (-3/2\ b +3/4\ b\ )\ Fb\ 1/EJ\ = -3/4\ \ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-1/2 + x/b -1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= [-1/2\ x +1/2\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/2\ b +1/2\ b -1/6\ b\ )\ Fb\ 1/EJ\ - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = 5/6\ \ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2\ x^2/b^2\ )\ Fb\ 1/EJ\ dx - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = [-1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ\ - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ$

$= (-1/6\ b\ )\ Fb\ 1/EJ\ - 1\ \ (-1)\ \ 1\ \ Fb^2/EJ = 5/6\ \ Fb^2/EJ$

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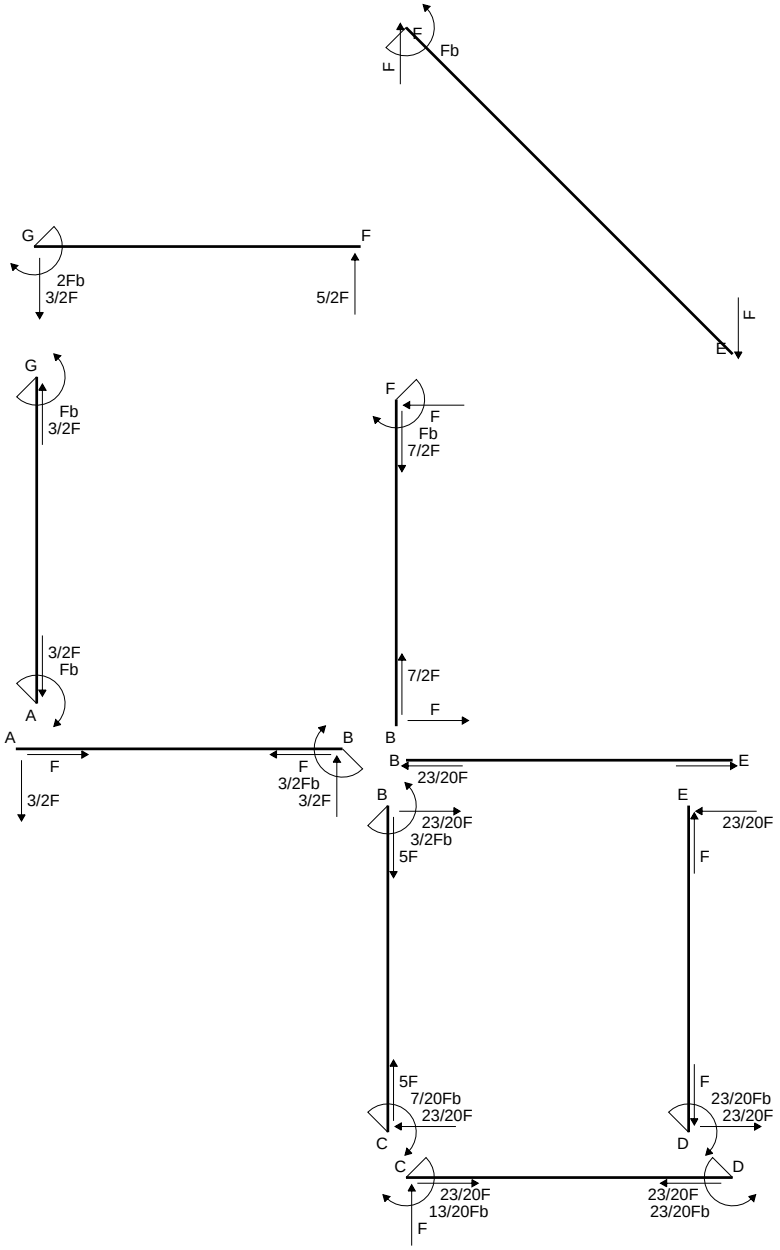
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7/20Fb
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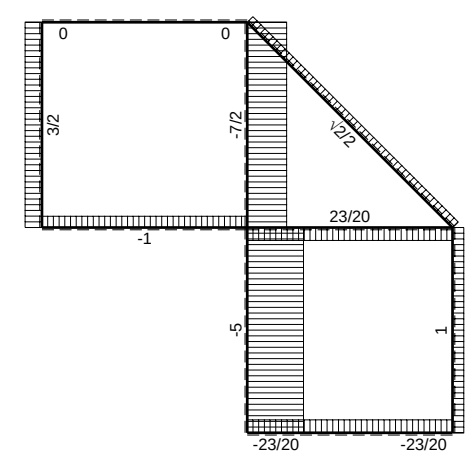
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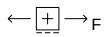
½/2
23/20
-1
-5
1
-23/20
-23/20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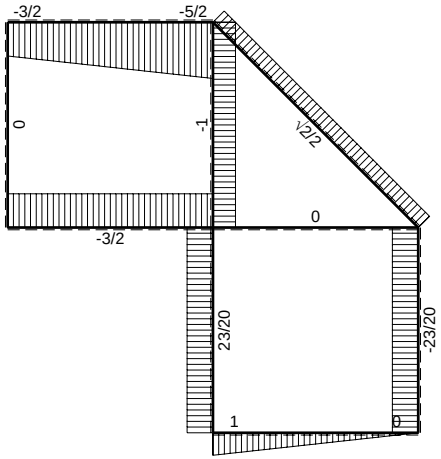
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0


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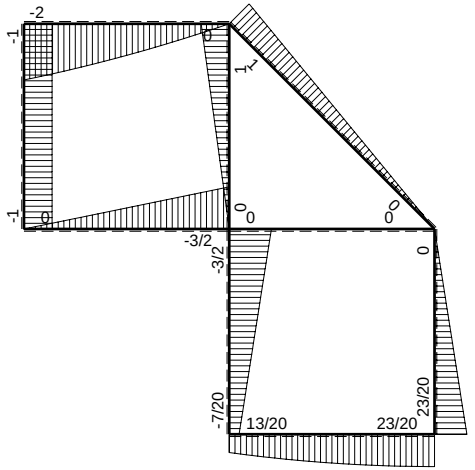
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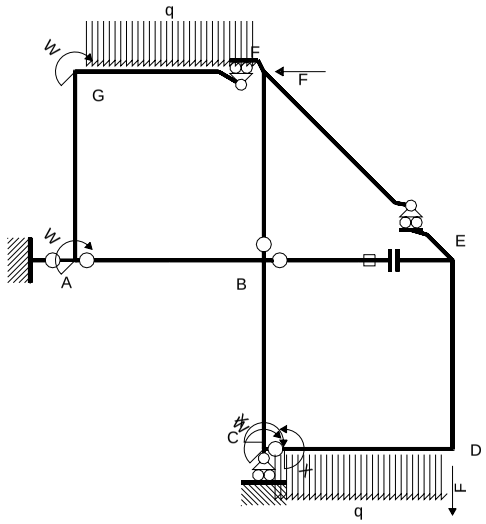
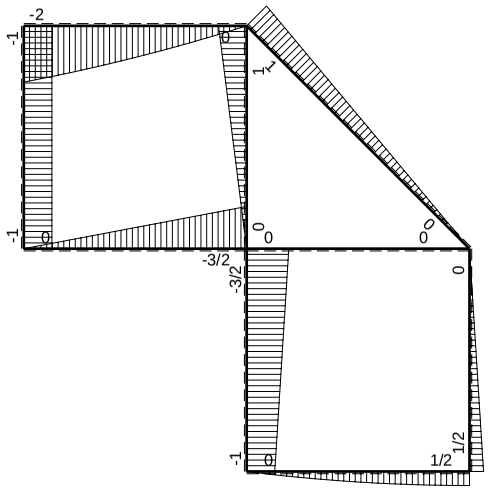
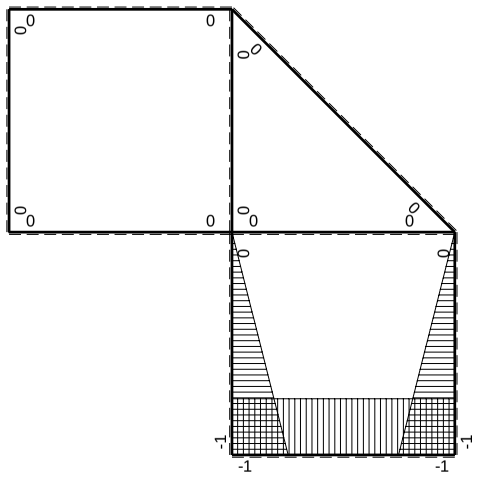
23/20


Fb





M_0 flessione da carichi assegnati



M_x flessione da iperstatica X=1

Quadro contributi PLV per iperstatica $X=W_{CD}$

→	$M_x(x)$	$M_o(x)$	M_xM_o	M_xM_x	$\int M_xM_o/EJdx$	$\int XM_xM_x/EJdx$
AB b	0	-3/2Fx	0	0	0	0
BA b	0	3/2Fb-3/2Fx	0	0		
BC b	-x/b	-3/2Fb+1/2Fx	$3/2Fx-1/2Fx^2/b$	x^2/b^2	$7/12Fb^2/EJ$	1/3Xb/EJ
CB b	1-x/b	Fb+1/2Fx	$Fb-1/2Fx-1/2Fx^2/b$	$1-2x/b+x^2/b^2$		
CD b	-1	$Fx-1/2qx^2$	$-Fx+1/2Fx^2/b$	1	$-1/3Fb^2/EJ$	Xb/EJ
DC b	1	$-1/2Fb+1/2qx^2$	$-1/2Fb+1/2Fx^2/b$	1		
DE b	-1+x/b	1/2Fb-1/2Fx	$-1/2Fb+Fx-1/2Fx^2/b$	$1-2x/b+x^2/b^2$	$-1/6Fb^2/EJ$	1/3Xb/EJ
ED b	x/b	-1/2Fx	$-1/2Fx^2/b$	x^2/b^2		
EF $\sqrt{2}$b	0	$\sqrt{2}/2Fx$	0	0	0	0
FG b	0	$-5/2Fx+1/2qx^2$	0	0	0	0
GF b	0	$2Fb-3/2Fx-1/2qx^2$	0	0		
GA b	0	-Fb	0	0	0	0
AG b	0	Fb	0	0		
FB b	0	Fb-Fx	0	0	0	0
BF b	0	-Fx	0	0		
BE b	0	0	0	0	0	0
EB b	0	0	0	0		
BE	elongazione asta $N_{1BE}\varepsilon_{BE}L_{BE}$				Fb^2/EJ	
	totali				$13/12Fb^2/EJ$	5/3Xb/EJ
	iperstatica $X=W_{CD}$				-13/20Fb	

Sviluppi di calcolo iperstatica

$L^{XX}_{BC} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CB} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{CD} = \int_o^b (1)\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b)\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DC} = \int_o^b (1)\ 1/EJ\ dx = [\ x\ ]_o^b\ 1/EJ$

$= (\ b)\ 1/EJ\ =\ b/EJ$

$L^{XX}_{DE} = \int_o^b (1 -2\ x/b + x^2/b^2)\ 1/EJ\ dx = [\ x - x^2/b +1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (\ b - b +1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{XX}_{ED} = \int_o^b (x^2/b^2)\ 1/EJ\ dx = [1/3\ x^3/b^2\ ]_o^b\ 1/EJ$

$= (1/3\ b)\ 1/EJ\ = 1/3\ b/EJ$

$L^{Xo}_{BC} = \int_o^b (3/2\ x/b -1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [3/4\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (3/4\ b -1/6\ b)\ Fb\ 1/EJ\ = 7/12\ Fb^2/EJ$

$L^{Xo}_{CB} = \int_o^b (1 -1/2\ x/b -1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [\ x -1/4\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (\ b -1/4\ b -1/6\ b)\ Fb\ 1/EJ\ = 7/12\ Fb^2/EJ$

$L^{Xo}_{CD} = \int_o^b (-\ x/b +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [-1/2\ x^2/b +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +1/6\ b)\ Fb\ 1/EJ\ = -1/3\ Fb^2/EJ$

$L^{Xo}_{DC} = \int_o^b (-1/2 +1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [-1/2\ x +1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +1/6\ b)\ Fb\ 1/EJ\ = -1/3\ Fb^2/EJ$

$L^{Xo}_{DE} = \int_o^b (-1/2 + x/b -1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [-1/2\ x +1/2\ x^2/b -1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/2\ b +1/2\ b -1/6\ b)\ Fb\ 1/EJ\ = -1/6\ Fb^2/EJ$

$L^{Xo}_{ED} = \int_o^b (-1/2\ x^2/b^2)\ Fb\ 1/EJ\ dx = [-1/6\ x^3/b^2\ ]_o^b\ Fb\ 1/EJ$

$= (-1/6\ b)\ Fb\ 1/EJ\ = -1/6\ Fb^2/EJ$

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