

Soluzione del telaio secondo il Metodo delle Forze (MdF)

à Dati Numerici

```
Clear@EqD;
```

ü Dati Generali

```
L1 = 400;
L2 = 600;
H = 300;
q = 50;

F = q H
EIt = 288480 30 50^3 è 12
EIp = 288480 30 30^3 è 12
KP = N@2050000 Pi 3^2 è 4 è Sqrt@L1^2 + H^2DD
Omega = N@ArcTan@H è L1DD

15000

90150000000

19472400000

28981.2

0.643501
```

Ü Asta AD

AlphaAD = $H \hat{e} H_3 EI_p L$

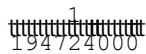
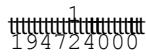
AlphaDA = $H \hat{e} H_3 EI_p L$

BetaAD = $H \hat{e} H_6 EI_p L$

BetaDA = **BetaAD**

GammaAD = 0

GammaDA = 0



0

0

Ü Asta BE

AlphaBE = $H \hat{e} H_3 EI_p L$

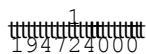
AlphaEB = $H \hat{e} H_3 EI_p L$

BetaBE = $H \hat{e} H_6 EI_p L$

BetaEB = **BetaBE**

GammaBE = 0

GammaEB = 0



0

0

Ü Asta CG

$$\text{AlphaCG} = H \hat{e} H_3 E I p L$$

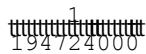
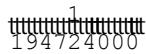
$$\text{AlphaGC} = H \hat{e} H_3 E I p L$$

$$\text{BetaCG} = H \hat{e} H_6 E I p L$$

$$\text{BetaGC} = \text{BetaCG}$$

$$\text{GammaCG} = 0$$

$$\text{GammaGC} = 0$$



$$0$$

$$0$$

Ü Asta DE

$$\text{AlphaDE} = L1 \hat{e} H_3 E I t L$$

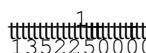
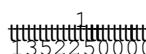
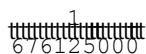
$$\text{AlphaED} = L1 \hat{e} H_3 E I t L$$

$$\text{BetaDE} = L1 \hat{e} H_6 E I t L$$

$$\text{BetaED} = \text{BetaDE}$$

$$\text{GammaDE} = q L1^3 \hat{e} 24 E I t$$

$$\text{GammaED} = -q L1^3 \hat{e} 24 E I t$$



Ü Asta EG

```

AlphaEG = L2 ê H3 EItL
AlphaGE = L2 ê H3 EItL
BetaEG = L2 ê H6 EItL
BetaGE = BetaEG
GammaEG = q L2 ^ 3 ê 24 ê EIt
GammaGE = -q L2 ^ 3 ê 24 ê EIt

```

-

à Incognite

```
Incognite = $MAD, MCG, MDA, MED, MEG, MGC, MDE, MEB, MGE, Delta<;
```

à Equazioni

```
Eq = Table@0, 8i, 1, 10<D;
```

Ü Equazioni di Congruenza alla rotazione Nodale

```

Eq@@1DD = FiAD;
Eq@@2DD = FiCG;
Eq@@3DD = FiDA - FiDE;
Eq@@4DD = FiED - FiEB;
Eq@@5DD = FiEG - FiEB;
Eq@@6DD = FiGC - FiGE;

```

Ü Equazioni di Equilibrio alla rotazione Nodale

```

Eq@@7DD = MDE + MDA;
Eq@@8DD = MED + MEB + MEG;
Eq@@9DD = MGE + MGC;

```

Ü Equazioni di Equilibrio Globale alla traslazione

$$\text{Eq@@10DD} = -H \cdot MDA + MAD \cdot \dot{H} + MEB \cdot \dot{H} + H \cdot MCG + MGCL \cdot \dot{H} + F - XE \cdot \cos@\Omega DL;$$

Ü Definizione delle rotazioni in funzione dei momenti

$$\begin{aligned} FiAD &= AlphaAD \cdot MAD - BetaAD \cdot MDA + Delta \cdot \dot{H}; \\ FiDA &= AlphaDA \cdot MDA - BetaDA \cdot MAD + Delta \cdot \dot{H}; \\ FiDE &= AlphaDE \cdot MDE - BetaDE \cdot MED + GammaDE; \\ FiED &= AlphaED \cdot MED - BetaED \cdot MDE + GammaED; \\ FiEG &= AlphaEG \cdot MEG - BetaEG \cdot MGE + GammaEG; \\ FiGE &= AlphaGE \cdot MGE - BetaGE \cdot MEG + GammaGE; \\ FiEB &= AlphaEB \cdot MEB + Delta \cdot \dot{H}; \\ FiGC &= AlphaGC \cdot MGC - BetaGC \cdot MCG + Delta \cdot \dot{H}; \\ FiCG &= AlphaCG \cdot MCG - BetaCG \cdot MGC + Delta \cdot \dot{H}; \end{aligned}$$

Ü Relazione tra Spostamento e Forza del Pendolo

$$XE = KP \cdot Delta \cdot \cos@\Omega D;$$

à Soluzione del sistema

```
Sol = NSolve@Eq ~ 0, IncogniteD // Flatten
```

$$\begin{aligned} 8MAD &= -402381., MCG &= -680239., MDA &= -307052., MED &= 1.6211 \times 10^6, MEG &= -1.5069 \times 10^6, \\ MGC &= -862768., MDE &= 307052., MEB &= -114194., MGE &= 862768., Delta &= 0.383396 \end{aligned}$$