Ejercicio 2

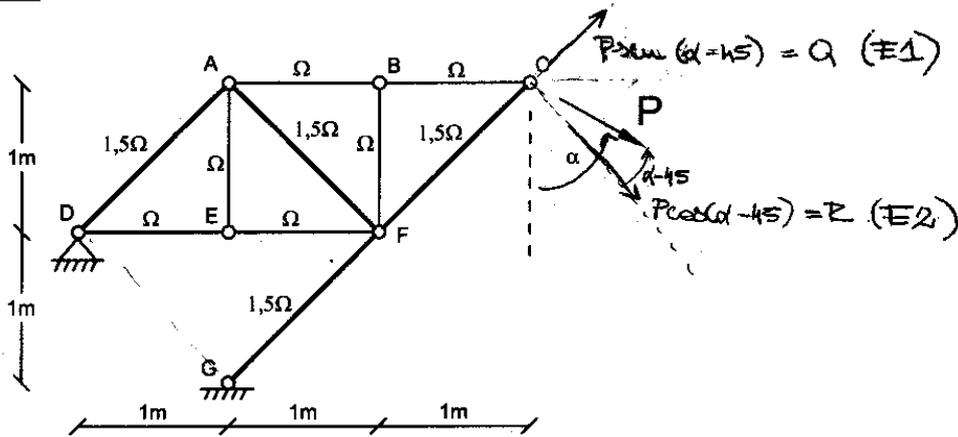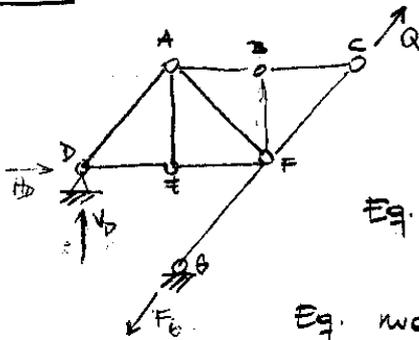$P \operatorname{sen}(\alpha - 45) = Q \quad (E1)$

$P \cos(\alpha - 45) = R \quad (E2)$

a) Vamos a resolver el problema como la superposición de (E1) y (E2)

ESTADO 1

Eq. Global:

$\sum M_D = \sqrt{2} \cdot Q - \sqrt{2} \, F_G = 0 \Rightarrow \boxed{F_G = Q}$

$\sum V = 0 \Rightarrow \boxed{V_D = 0} \quad ; \quad \sum H = 0 \Rightarrow \boxed{H_D = 0}$
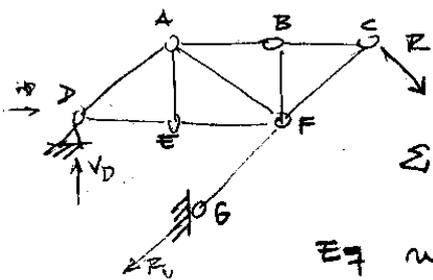
Eq. nudo C: $\boxed{F_{CF} = +Q}$

$\boxed{F_{BC} = 0}$

Eq. nudo D: $\boxed{F_{AD} = 0}$

$\boxed{F_{DE} = 0}$

ESTADO 2

$\sum M_D = 2\sqrt{2} \cdot R + \sqrt{2} \cdot R_G = 0 \Rightarrow \boxed{R_G = -2R}$

$\sum V = V_D - \dfrac{R}{\sqrt{2}} + \dfrac{2R}{\sqrt{2}} = 0 \Rightarrow \boxed{V_D = -\dfrac{R}{\sqrt{2}}}$

$\sum H = H_D + \dfrac{R}{\sqrt{2}} + \dfrac{2R}{\sqrt{2}} = 0 \Rightarrow \boxed{H_D = -\dfrac{3R}{\sqrt{2}}}$

Eq. nudo C: $\boxed{F_{BC} = \sqrt{2} R}$

$\boxed{F_{CF} = -R}$

Eq. nudo D: $\boxed{F_{DE} = \sqrt{2} R}$

$\boxed{F_{AD} = R}$

$$F_{BF} = Q - 2R = P\,sen(\alpha - 45) - 2P\cos(\alpha - 45)$$

$$F_{AD} = R = P\cos(\alpha - 45)$$

$$F_{GF} = F_{AD} \Rightarrow P\,sen(\alpha - 45) - P\cos(\alpha - 45) = P\cos(\alpha - 45)$$

$$tan(\alpha - 45) = 3 \Rightarrow \alpha - 45 = 71,6°$$

$$\boxed{\alpha = 116,6°}$$

b) Sólo queda encontrar las fuerzas en AE, EF, AF, BF, AB. Sigo trabajando con los dos estados y al final sumo y sustituyo α.

$\underline{E1}$ Nudo E: $\boxed{F_{AF} = 0}$ $\boxed{F_{EF} = 0}$ Nudo A: $\boxed{F_{AB} = 0}$ $\boxed{F_{AF} = 0}$

Nudo B: $\boxed{F_{BF} = 0}$.

$\underline{E2}$

Nudo E: F_{AE} , ER , F_{EF} $\boxed{F_{AE} = 0}$ $\boxed{F_{EF} = +\sqrt{2}\,R}$

Nudo A F_{AB} , F_{AF} , F_{AB} $\boxed{F_{AD} = \sqrt{2}\,R}$ $\boxed{F_{AF} = -R}$

Nudo B. $\sqrt{2}R$ $\sqrt{2}R$ $\boxed{F_{BF} = 0}$

Barra	F(E1)	F(E2)	F_{TOTAL}	σ	Δl (cm)
DE	0	+0,447P	+0,447P	+0,447P	0,067
EF	0	+0,447P	+0,447P	+0,447P	0,067
AD	0	+0,316P	+0,316P	0,211P	0,044
AE	0	0	0	0	0
AF	0	-0,316P	-0,316P	-0,211P	-0,044
BF	0	0	0	0	0
FC	+0,949P	-0,316P	+0,633P	+0,442P	0,093
AB	0	+0,447P	+0,447P	0,447P	0,067
BC	0	+0,447P	+0,447P	0,447P	0,067
FG	+0,949P	-0,632P	+0,316P	0,211P	0,044

$$0,447P \leq 1,4 \ t/cm^2 \rightarrow \boxed{P \leq 3,13\ t}$$
$$cm^2 \qquad\qquad \boxed{E = 3,1 \times 10^3\ t/cm^2}$$

$4 \text{cm} \sim 0,25 \text{mm}.$

$\Delta \ell_{FA}$
$= \Delta \ell_{bF}$
$\Delta \ell_{DE}$ $\Delta \ell_{EF}$

$D - D' = b'$

$\Delta \ell_{bc}$

F'

$\Delta \ell_{FA}$

D'

C'

E' A' $\Delta \ell_{AB+DC}$