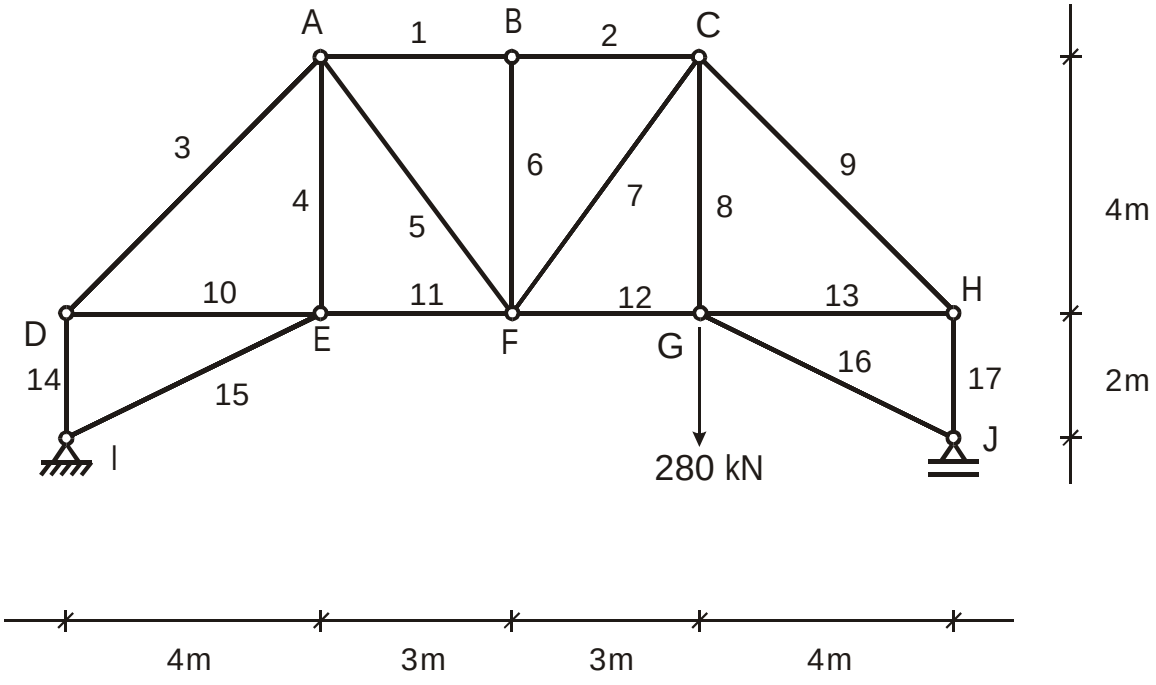
PEF – 2200 Introdução à Mecânica das Estruturas – Prova de Recuperação – 31.7.2003

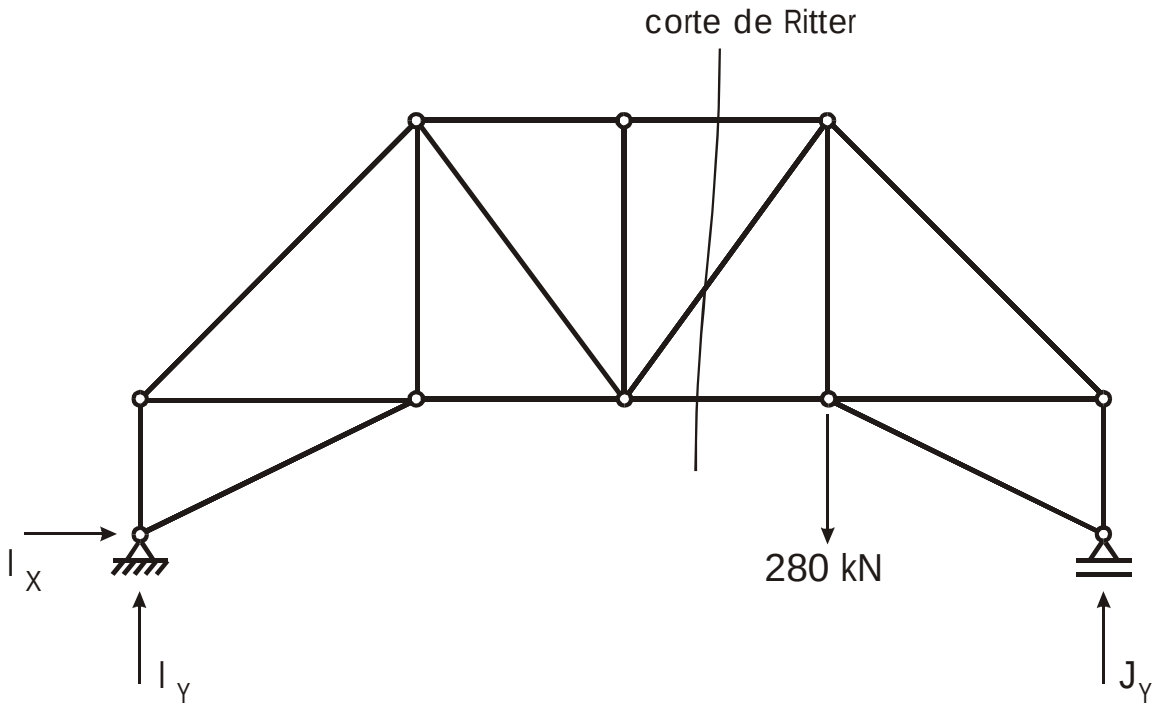
Questão 2 (3,0)

Para a treliça ilustrada, pedem-se:

a) as reações de apoio;
b) as forças normais nas barras 2, 7 e 12;
c) as forças normais nas barras 8 e 9.



Resolução:

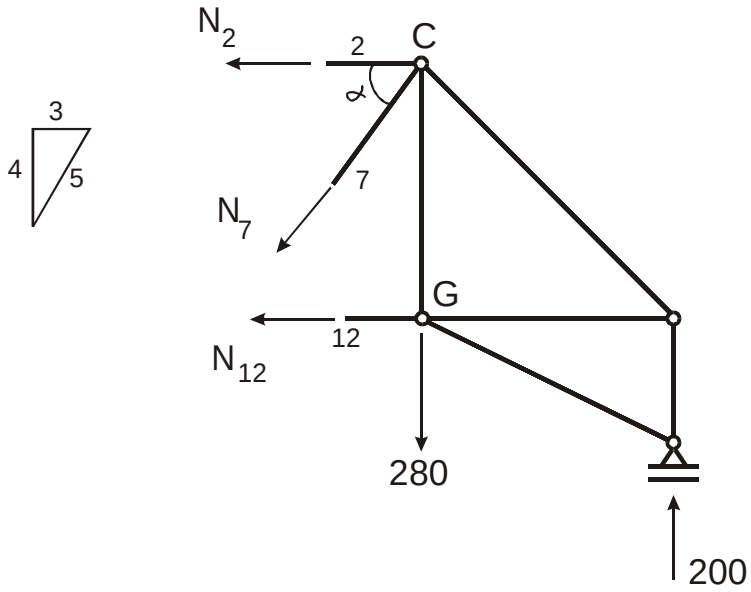


$$a)\ \sum F_X = 0 \ \Rightarrow\ \mathrm{I_X} = 0$$

$$\sum F_Y = 0 \ \Rightarrow\ \mathrm{I_Y} + J_Y - 280 = 0 \ \Rightarrow\ I_Y = 80kN$$

$$\sum M_I = 0 \ \Rightarrow\ -280.10 + J_Y.14 = 0 \ \Rightarrow\ J_Y = 200kN$$

b)



$$\cos\alpha = \frac{3}{5} = \frac{N_{7X}}{N_7}$$

$$N_{7X} = N_7 . \frac{3}{5}$$

$$N_{7Y} = N_7 . \frac{4}{5}$$

$$\sum M_F = 0 \Rightarrow \mathrm{N}_2 .4 - 280.3 + 200.7 = 0 \Rightarrow \mathrm{N}_2 = -140kN$$

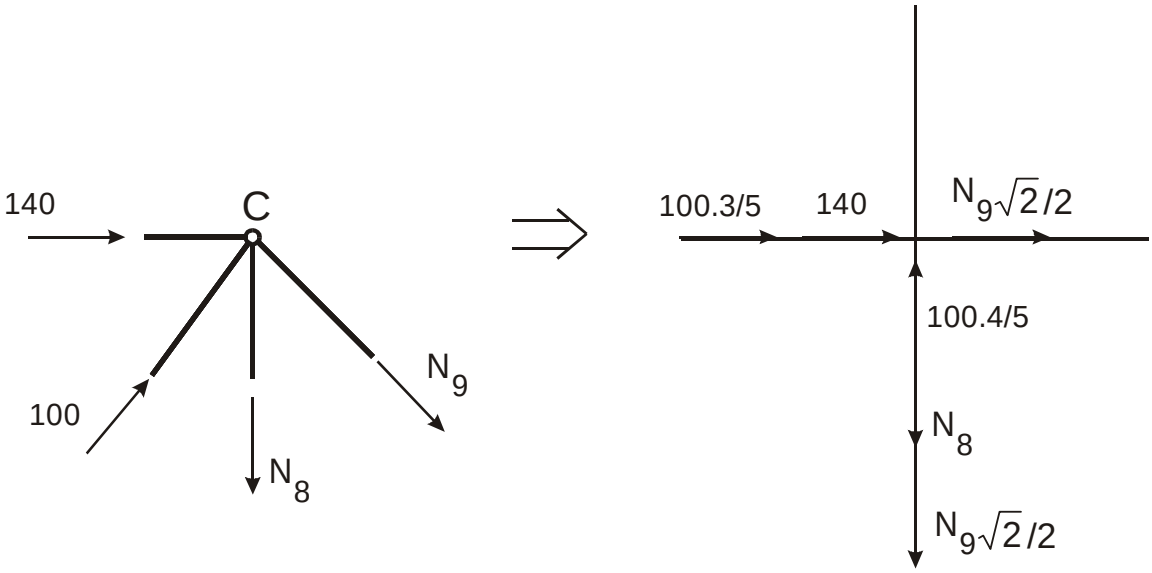
$$\sum M_C = 0 \Rightarrow -\mathrm{N}_{12} .4 + 200.4 = 0 \Rightarrow \mathrm{N}_{12} = 200kN$$

$$\sum M_G = 0 \Rightarrow \mathrm{N}_2 .4 + \frac{3}{5} N_7 .4 + 200.4 = 0$$

$$-140.4 + \frac{3}{5} N_7 .4 + 200.4 = 0$$

$$\mathrm{N}_7 = -100kN$$

c)



$$\sum F_X = 0 \Rightarrow N_9.\frac{\sqrt{2}}{2} + 140 + 100.\frac{3}{5} = 0 \Rightarrow N_9 = -282{,}84kN$$

$$\sum F_Y = 0 \Rightarrow 100.\frac{4}{5} - N_8 + 282{,}84.\frac{\sqrt{2}}{2} = 0 \Rightarrow N_8 = 280kN$$