

Prova de Pórticos Planos – Ensino Remoto Emergencial

Grupo: Legião Urbana

Integrantes:

Ana Sofia Pelosi Drummond – 201710035911

Fernanda Alves Maranhão da Rocha Barbosa – 201710278211

Fernanda Barreto Rodrigues - 201520766813

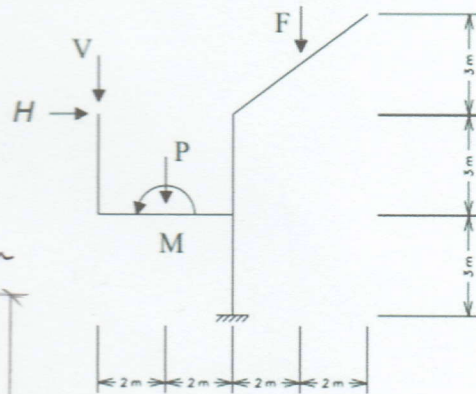
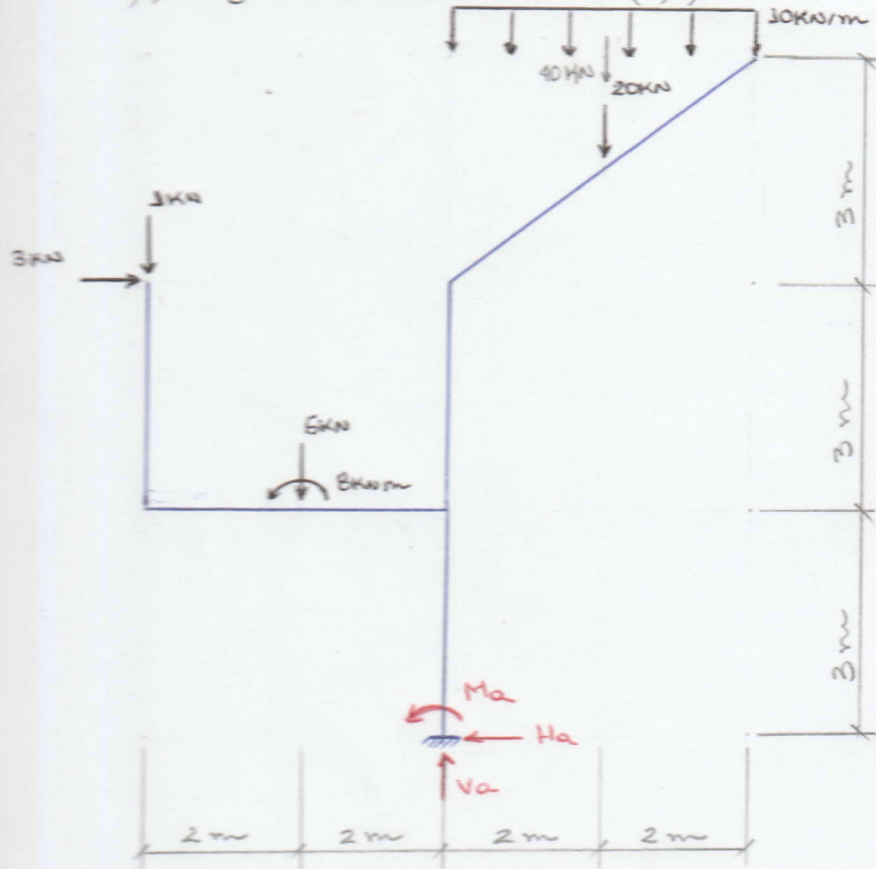
1 – Para o pórtico do seu grupo, pede-se:

a) Considerar uma carga distribuída de  $q$  kN/m para baixo (medida na horizontal) na barra inclinada e fazer o cálculo das reações de apoio (0,5):

b) Diagrama de Esforço Normal (1,0):

c) Diagrama de Esforço Cortante (1,0):

d) Diagrama de Momento Fletor (2,0):



a) cálculo das reações de apoio:

$$\sum F_x = 0: 3 - H_a = 0$$

$$H_a = 3 \text{ kN}$$

$$\sum F_y = 0: V_a - 5 - 1 - 20 - 40 = 0$$

$$V_a = 66 \text{ kN}$$

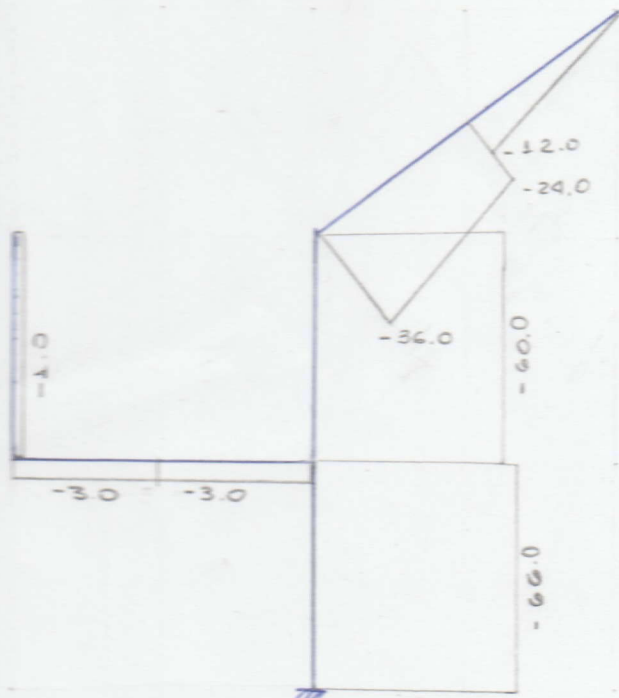
$$\sum M_z = 0: (\text{no ponto A})$$

$$-M_a - 8 - (5 \cdot 2) - (1 \cdot 4) + (3 \cdot 6) + (20 \cdot 2) + (40 \cdot 2) = 0$$

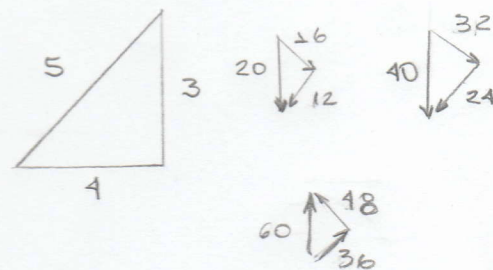
$$M_a = 80 + 40 + 18 - 4 - 10 - 8$$

$$M_a = 116 \text{ kNm}$$

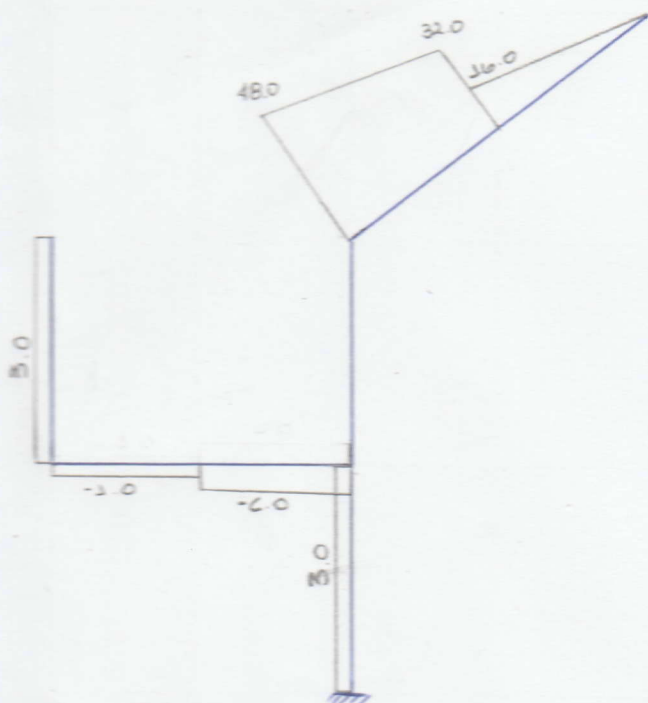
b) Diagrama de normal:



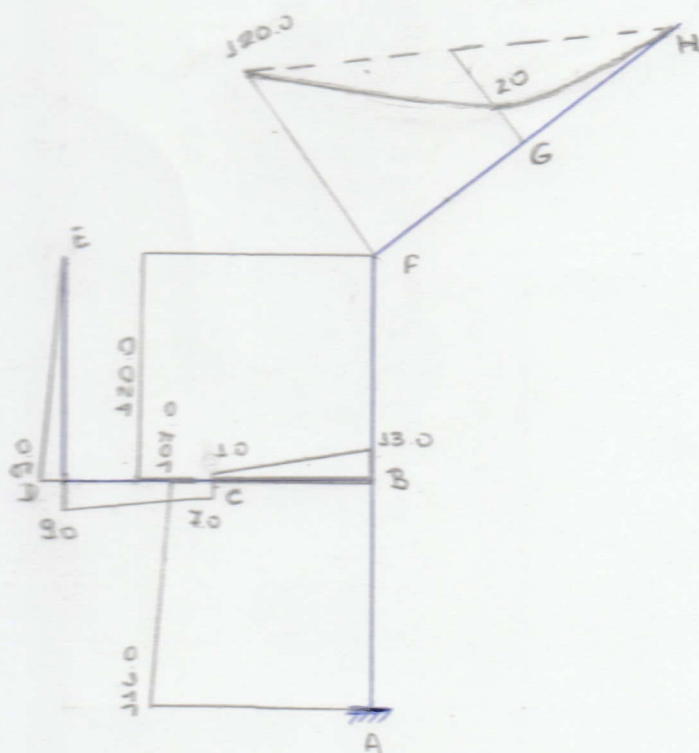
na viga inclinada:



c) Diagrama de cortante:



~> Diagrama de momento:



• cálculos:

$$A = 116$$

$$B_A = (H_A \cdot 3) + 116 = 307$$

$$B_D = (H_A \cdot 3) + 116 + 8 + (5 \cdot 2) + (1 \cdot 4) + (3 \cdot 3) = (116 + 8 + 10 + 4) - (9 + 9) = 120$$

$$F = 116 + 8 + (3 \cdot 6) + (5 \cdot 2) + (1 \cdot 4) = 120$$

$$D = (116) + 8 + (3 \cdot 3) + (66 \cdot 4) + (5 \cdot 2) + (20 \cdot 6) + (40 \cdot 6) = (116 + 8 + 264) - (9 + 10 + 120 + 240) = 388 + 379 = 9$$

$$D_B = (3 \cdot 3) = 9$$

$$C_A = (1 \cdot 2) + (3 \cdot 3) = 7$$

$$C_D = 7 + 8 = 15$$

$$B_E = (1 \cdot 4) + (3 \cdot 3) + (5 \cdot 2) + 8 = 13$$

$$G = 116 + (66 \cdot 2) + (3 \cdot 7.5) + (8) + (5 \cdot 4) + (1 \cdot 6) + (3 \cdot 1.5) + (20 \cdot 1) = (116 + 8 + 20 + 6 + 4.5 + 20) - (13.2 + 22.5) = 174.5 + 154.5 = 20$$

$$H = 116 + 8 + (3 \cdot 9) + (66 \cdot 4) + (5 \cdot 6) + (1 \cdot 8) + (3 \cdot 3) + (40 \cdot 2) + (20 \cdot 2) = 0$$

$$M_{máx}_1 = \frac{10 \cdot (4)^2}{8} = 20$$



2 – Um dos métodos de resolução de estruturas hiperestáticas é criar um sistema isostático através da colocação de rótulas em pontos estratégicos e liberação de algumas restrições nos apoios. A tabela de dados do seu grupo mostra as modificações aplicadas no pórtico abaixo para transformá-lo em um pórtico composto isostático. Após a colocação correta dos dados do grupo pede-se:

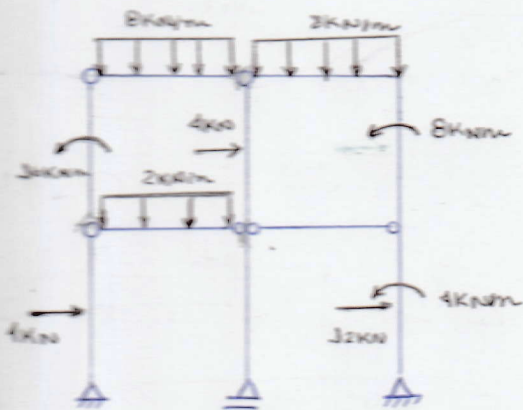
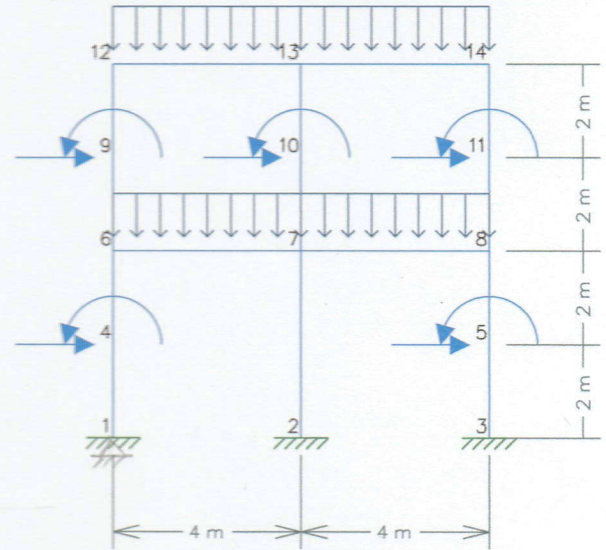
a) Decomposição e ordem de resolução (0,5):

b) Cálculo das reações de apoio (1,0):

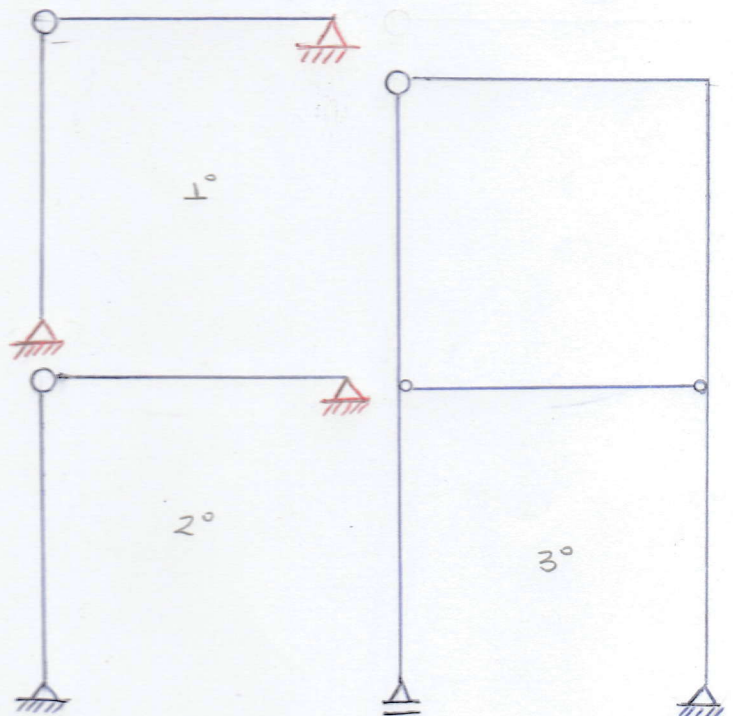
c) Diagrama de Esforço Normal (1,0):

d) Diagrama de Esforço Cortante (1,0):

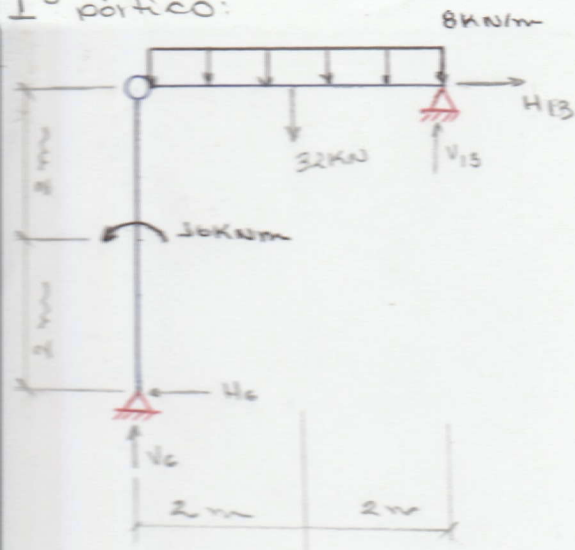
e) Diagrama de Momento Fletor (2,0):



a)



1º pórtico:



$$\sum F_x = 0 \therefore H_c = H_{13}$$

$$\sum F_y = 0 \therefore V_c + V_{13} = 32$$

$$\sum M_z = 0 \text{ (no ponto J3)} = -36 + (V_c \cdot 4) + (H_c \cdot 4) - (32 \cdot 2) = 0$$

$$4V_c + 4H_c = 80$$

$$V_c + H_c = 20$$

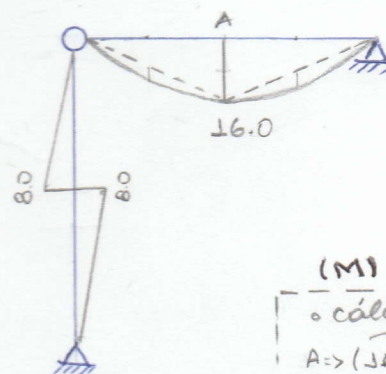
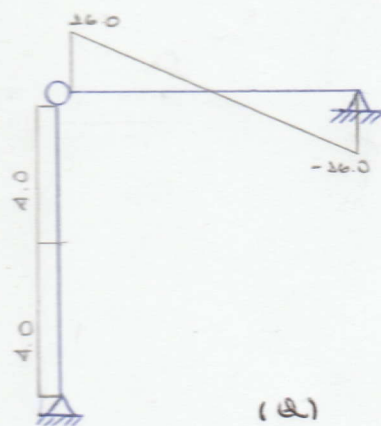
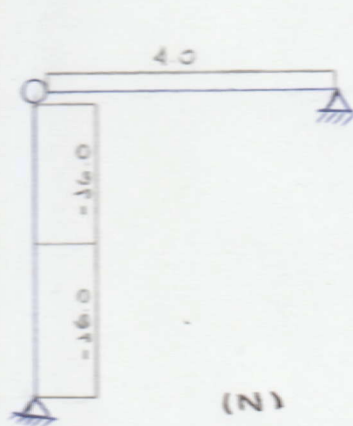
$$M_{rot E} = 0 \therefore +4H_c - 36 = 0$$

$$H_c = 4 \text{ kN}$$

$$V_c = 36 \text{ kN}$$

$$H_{13} = 4 \text{ kN}$$

$$V_{13} = 36 \text{ kN}$$



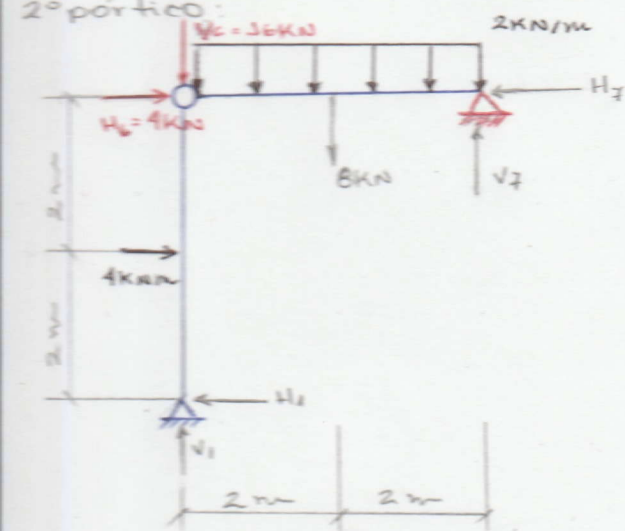
(M)

• cálculos

$$A = (36 \cdot 2) + (4 \cdot 4) + \frac{36}{8} + (36 \cdot 1) = 16$$

$$M_{\max} = \frac{8 \cdot (2)^2}{8} = 4$$

2º pórtico:



$$\sum F_x = 0 \therefore 4 + 4 - H_1 - H_7 = 0$$

$$H_1 + H_7 = 8$$

$$\sum F_y = 0 \therefore V_1 + V_7 - 8 - 36 = 0$$

$$V_1 + V_7 = 24$$

$$\sum M_z = 0 \text{ (no ponto 7)}$$

$$+(4H_1) - (4 \cdot 2) + (36 \cdot 4) - (8 \cdot 2) + 4V_1 = 0$$

$$4H_1 + 4V_1 = 88$$

$$H_1 + V_1 = 22$$

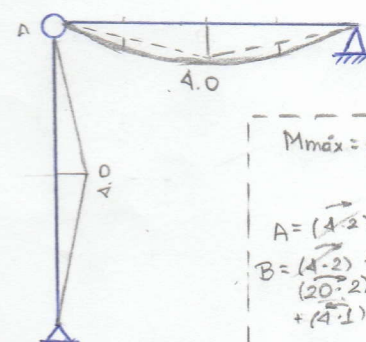
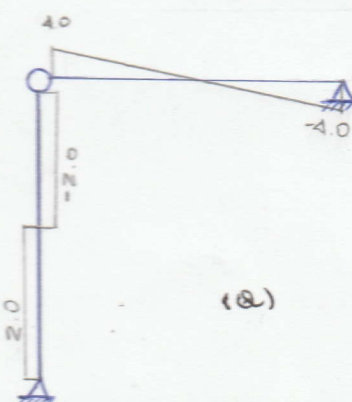
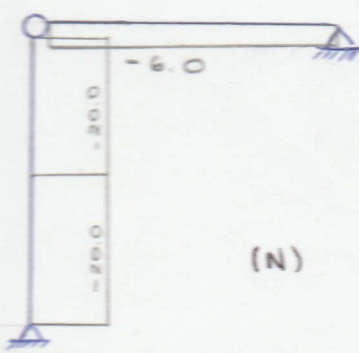
$$M_{rot E} = 0 \therefore +4H_1 - (4 \cdot 2) = 0$$

$$H_1 = 2 \text{ kN}$$

$$V_1 = 20 \text{ kN}$$

$$H_7 = 6 \text{ kN}$$

$$V_7 = 4 \text{ kN}$$

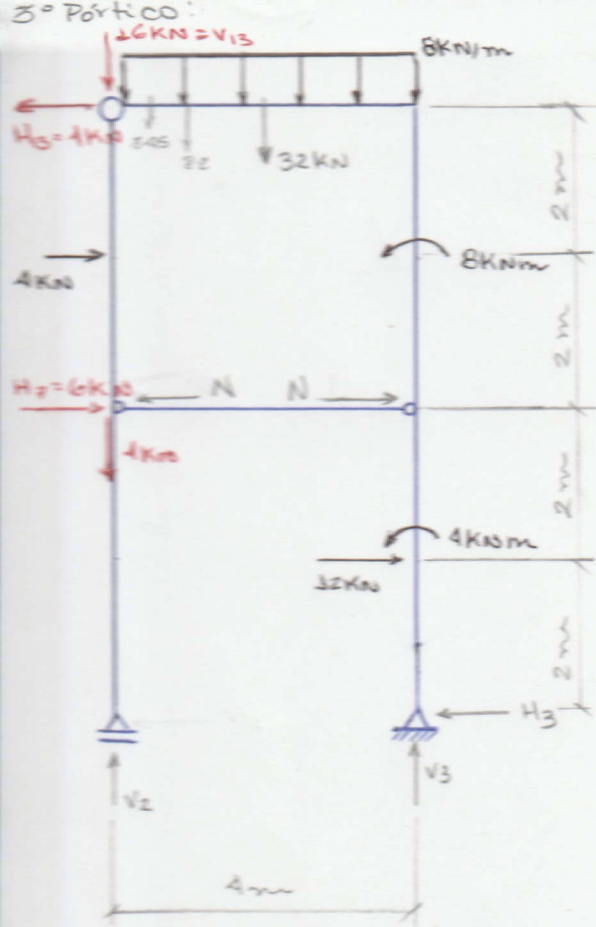


(M)

$$M_{\max} = \frac{q \cdot l^2}{8} = \frac{2 \cdot 2^2}{8} = 1$$

$$A = (4 \cdot 2) + (4 \cdot 2) + \frac{20}{8} + (4 \cdot 2) + \frac{4}{8} = 4$$





$$\sum F_x = 0 \therefore -A + A + 6 + 12 - H_3 = 0$$

$$H_3 = 18 \text{ kN}$$

$$\sum F_y = 0 \therefore V_2 + V_3 - 4 - 36 - 32 = 0$$

$$V_2 + V_3 = 52$$

$$\sum M_3 = 0 \therefore (\text{no ponto 3})$$

$$(4V_2) - (4 \cdot 4) + (6 \cdot 4) - 4 + (12 \cdot 2) + (4 \cdot 6) - (4 \cdot 8)$$

$$- (36 \cdot 4) - (32 \cdot 2) - 8 = 0$$

$$4V_2 = 16 - 24 + 4 - 24 - 24 + 32 + 64 + 64 + 8$$

$$4V_2 = 116$$

$$V_2 = 29 \text{ kN}$$

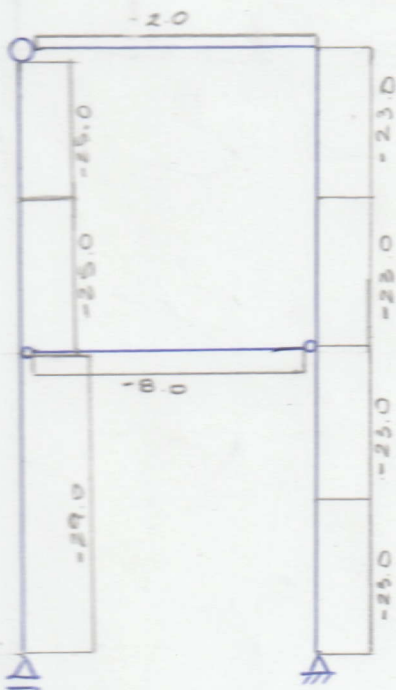
$$V_3 = 23 \text{ kN}$$

$$M_{rot E} = 0 \therefore - (6 \cdot 4) - (4 \cdot 2) + (N \cdot 4) = 0$$

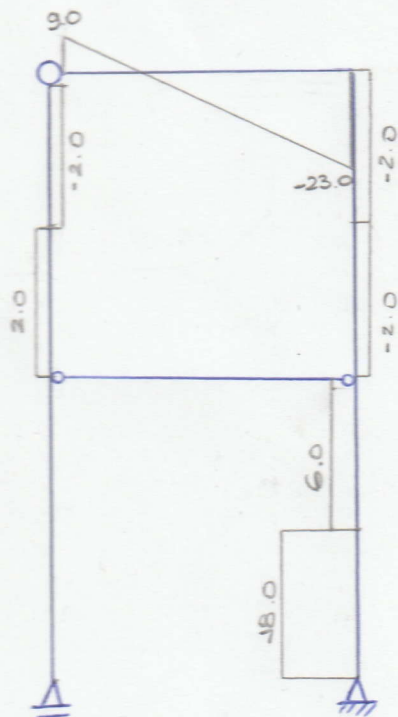
$$4N = 24 + 8$$

$$N = 8 \text{ kN}$$

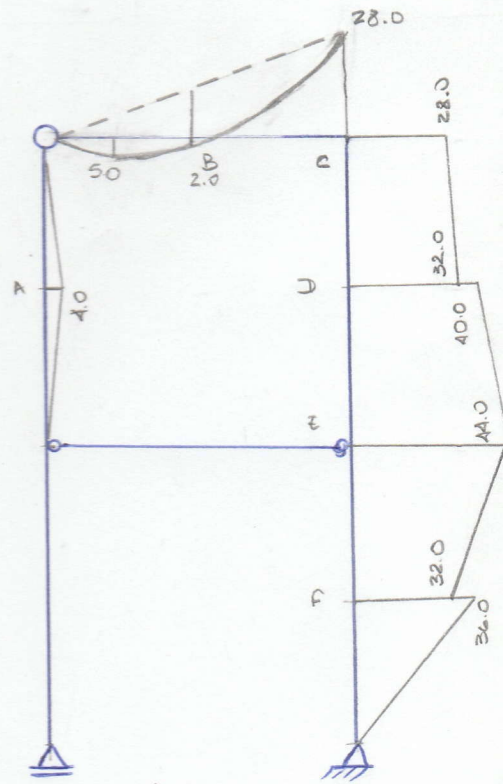
→ Esquerda



(N)



(Q)



(M)

calculos:

$$M_{max} = \frac{qL^2}{8} = \frac{8 \cdot 4^2}{8} = 16$$

$$A = (6 \cdot 2) + (18 \cdot 2) = 4$$

$$F_A = (38 \cdot 2) = 36$$

$$F_D = (18 \cdot 2) + 4 = 32$$

$$E = (18 \cdot 4) + 4 + (12 \cdot 2) = 44$$

$$D_A = (38 \cdot 6) + 4 + (12 \cdot 4) + (8 \cdot 2) = 40$$

$$D_D = (18 \cdot 6) + 4 + (12 \cdot 4) + (8 \cdot 2) + 8 = 32$$

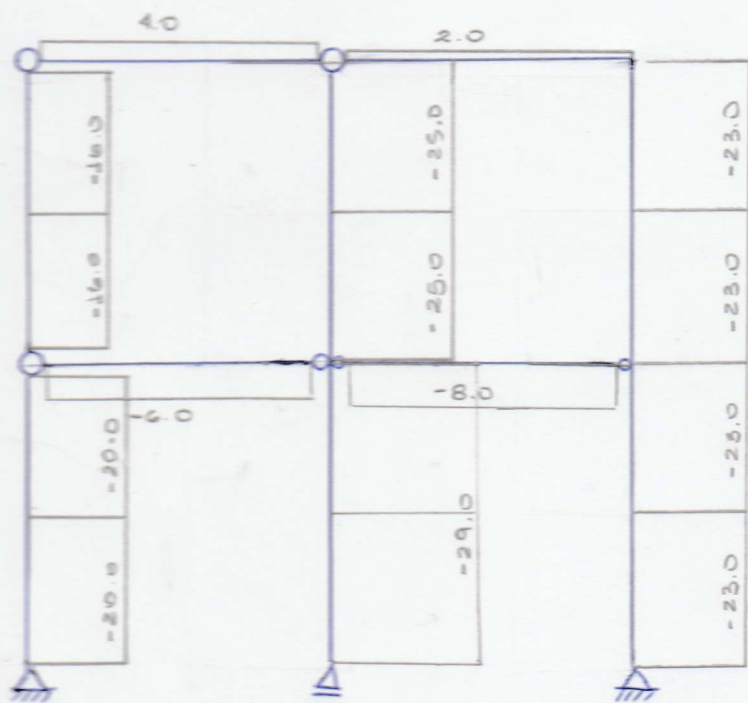
$$C_3 = (18 \cdot 8) + 4 + (12 \cdot 6) + (8 \cdot 4) + 8 = 28$$

$$B_2 = (29 \cdot 1) + (4 \cdot 1) + (46 \cdot 1) + (6 \cdot 4) + (4 \cdot 2) + (8 \cdot 4)$$

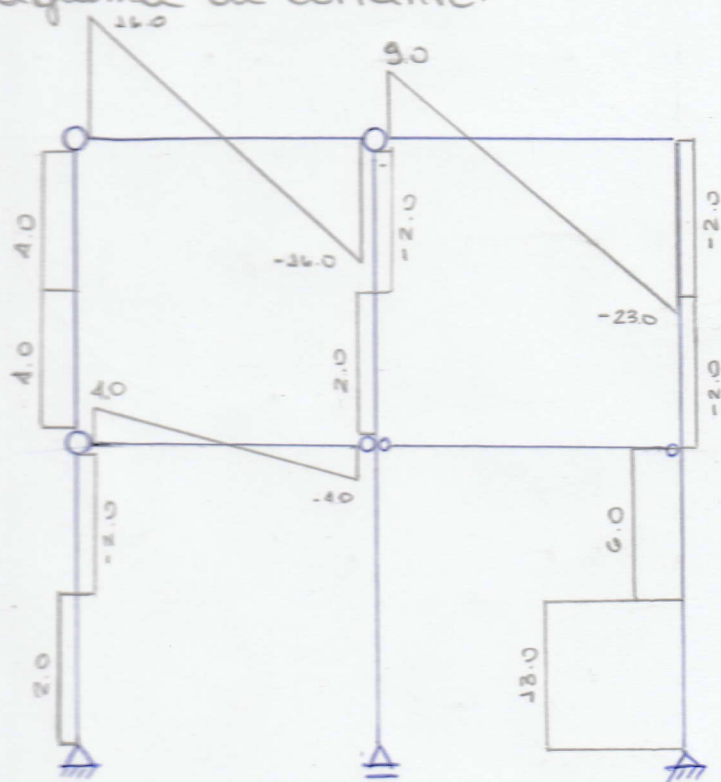
$$+ (4) = 29 + 4 + 36 + 24 + 8 + 4 + 32 = 5$$

$$B = (29 \cdot 2) + (4 \cdot 2) + (16 \cdot 2) + (6 \cdot 4) + (4 \cdot 2) + (8 \cdot 4) + (46 \cdot 1) = 58 + 36 - 8 - 32 - 24 + 8 = 2$$

c) Diagrama de Normal



d) Diagrama de cortante



2) Diagrama de momento flector.

