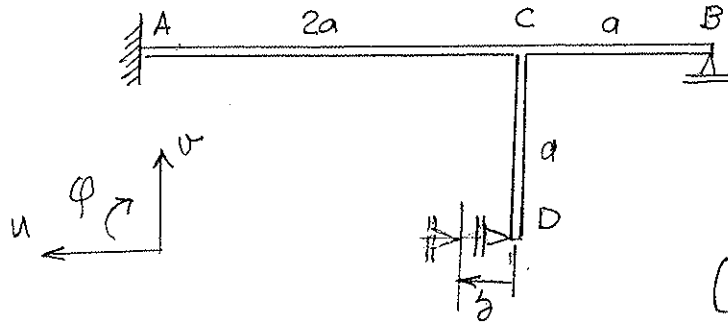


Ex

Determine o diagrama de momentos fletores para a estrutura da figura submetida a um deslocamento imposto δ do nó B. ($EI = \text{const.}$)

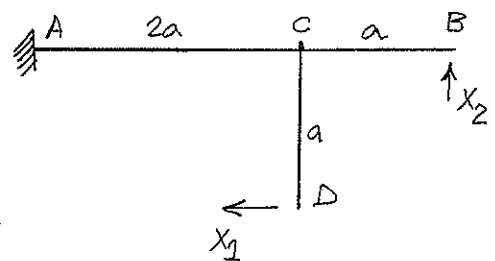


EIF

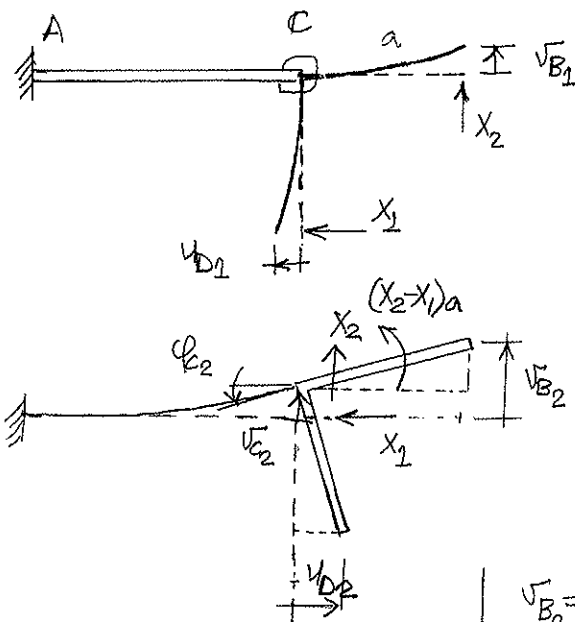
$GH = 5 - 3 = 2$

Equações de compatibilidade:

$$\left. \begin{aligned} u_D &= +\delta \\ v_B &= 0 \end{aligned} \right\} \begin{array}{l} \text{segue a convenção de} \\ \text{sentidos do enunciado.} \end{array}$$



Cálculo dos deslocamentos



Trechos CB e CD flexíveis empastados em AC rígido:

$$\left. \begin{aligned} v_{B1} &= \frac{x_2 a^3}{3EI} \\ u_{D1} &= \frac{x_1 a^3}{3EI} \end{aligned} \right\} \begin{array}{l} \text{sentidos indicados} \\ \text{na figura ao lado} \end{array}$$

$$u_{C2} = \frac{x_2 (2a)^2}{2EI} + \frac{(x_2 - x_1)a(2a)}{EI} = -\frac{2x_1 a^2}{EI} + \frac{4x_2 a^2}{EI}$$

$$v_{C2} = \frac{x_2 (2a)^3}{3EI} + \frac{(x_2 - x_1)a(2a)^2}{2EI} = -\frac{2x_1 a^3}{EI} + \frac{14x_2 a^3}{3EI}$$

$$v_{B2} = v_{C2} + u_{C2} a = -\frac{4x_1 a^3}{EI} + \frac{26x_2 a^3}{3EI}$$

$$u_{D2} = u_{C2} a = -\frac{2x_1 a^3}{EI} + \frac{4x_2 a^3}{EI}$$

Eqn. de compatibilidade:

$$u_D = u_{D1} - u_{D2} = +\frac{x_1 a^3}{3EI} + \frac{2x_1 a^3}{EI} - \frac{4x_2 a^3}{EI} = \delta$$

$$v_B = v_{B1} + v_{B2} = +\frac{x_2 a^3}{3EI} - \frac{4x_1 a^3}{EI} + \frac{26x_2 a^3}{3EI} = 0$$

$$\Rightarrow \begin{cases} \frac{7}{3}x_1 - 4x_2 = \frac{\delta EI}{a^3} & (1) \\ -4x_1 + 9x_2 = 0 & (2) \end{cases}$$

↖ sentidos na figura!

De (2): $X_1 = \frac{9}{4} X_2 \xrightarrow{(1)} \frac{7}{3} \frac{9}{4} X_2 - 4X_2 = \frac{8EI}{a^3} \Rightarrow \frac{5}{4} X_2 = \frac{8EI}{a^3}$

$X_2 = \frac{4}{5} \frac{8EI}{a^3}, \quad X_1 = \frac{9}{5} \frac{8EI}{a^3}$

Aplicando as forças X_1 e X_2 na EIF,

