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$$2) EI_{33} \frac{d^4 \theta}{dx^4} = q(x) \quad ; \quad q(x) = -q_0$$

$$\theta(0) = 0 \quad \theta(L) = 0 \quad \theta_3(0) = 0 \quad \theta_3(L) = 0$$

$$EI_{33} \frac{d^4 \theta}{dx^4} = -q_0 \quad ; \quad EI_{33} \frac{d^3 \theta}{dx^3} = V_3(x) = -q_0 x + C_1$$

$$EI_{33} \frac{d^2 \theta}{dx^2} = M_3(x) = -\frac{1}{2} q_0 x^2 + C_1 x + C_2$$

$$EI_{33} \theta = -\frac{1}{6} q_0 x^3 + \frac{1}{2} C_1 x^2 + C_2 x + C_3$$

$$EI_{33} \theta = -\frac{1}{24} q_0 x^4 + \frac{1}{6} C_1 x^3 + \frac{1}{2} C_2 x^2 + C_3 x + C_4$$

$$EI_{33} \theta(x=0) = C_4 = 0 \Rightarrow C_4 = 0$$

$$EI_{33} \theta_3(x=0) = C_3 = 0 \Rightarrow C_3 = 0$$

$$EI_{33} \theta_3(x=L) = -\frac{1}{6} q_0 L^3 + \frac{1}{2} C_1 L^2 + C_2 L = 0 \Rightarrow C_2 = \frac{1}{2} q_0 L - \frac{1}{4} C_1 L$$

$$EI_{33} \theta(x=L) = -\frac{1}{24} q_0 L^4 + \frac{1}{6} C_1 L^3 + \frac{1}{2} C_2 L^2 = 0 \Rightarrow C_1 = \frac{1}{2} q_0 L$$

$$C_2 = -\frac{1}{12} q_0 L^2$$

$$EI_{zz} \frac{d^2 \theta}{dx^2} = M_z(x) = -\frac{1}{2} q_0 x^2 + EI_{zz} (\Delta \theta_{z1} (x-x_1)^{-1} + \Delta \theta_{z2} (x-x_2)^{-1})$$

$$+ C_1 x + C_2$$

$$EI_{zz} \frac{d\theta}{dx} = -\frac{1}{6} q_0 x^3 + EI_{zz} (\Delta \theta_{z1} (x-x_1)^0 + \Delta \theta_{z2} (x-x_2)^0) + \frac{1}{2} C_1 x^2$$

$$+ C_2 x + C_3$$

$$EI_{zz} \theta = -\frac{1}{24} q_0 x^4 + EI_{zz} (\Delta \theta_{z1} (x-x_1)^1 + \Delta \theta_{z2} (x-x_2)^1) + \frac{1}{6} C_1 x^3$$

$$+ \frac{1}{2} C_2 x^2 + C_3 x + C_4$$

$$EI_{zz} v(x=0) = C_4 = 0 \Rightarrow C_4 = 0$$

$$EI_{zz} \theta_z(x=0) = C_3 = 0 \Rightarrow C_3 = 0$$

$$M_z(x=x_2) = -\frac{1}{2} q_0 x_2^2 + C_1 x + C_2 \Rightarrow C_1 x + C_2 = \frac{1}{2} q_0 x_2^2$$

$$EI_{zz} \theta_z(x=1) \Rightarrow EI_{zz} \Delta \theta_{z1} + EI_{zz} \Delta \theta_{z2} + \frac{1}{2} C_1 L^2 + C_2 = \frac{1}{6} q_0 L^3$$

$$EI_{zz} v(x=1) = -\frac{1}{24} q_0 L^4 + EI_{zz} (\Delta \theta_{z1} (1-x_1)^1 + \Delta \theta_{z2} (1-x_2))$$

$$+ \frac{1}{6} C_1 L^3 + \frac{1}{2} C_2 L^2$$

$$F_{133} \theta_{31} = 0$$

$$F_{133} \theta_{32} = 0$$

Clarear não igualar com o desmontar o artigo.
O mesmo acontece para o momento flutuante.

A descontinuidade de rotações causada pelo rótulo é nula, logo as rótulas também não afetam a deflexão e rotações da viga.

$$4) a) EI_{zz} \frac{d^4 v}{dx^4} = q(x), q(x) = R_{yB}(x-L)^{-1} - M_{zB}(x-L)^{-2}$$

$$v(0)=0 \quad v(2L)=0 \quad v(L)=0 \quad \theta_z(0)=0 \quad M_z(2L)=0$$

$$b) EI_{zz} \frac{d^4 v}{dx^4} = R_{yB}(x-L)^{-1} - M_{zB}(x-L)^{-2}$$

$$EI_{zz} \frac{d^3 v}{dx^3} = V_y(x) = R_{yB}(x-L)^0 - M_{zB}(x-L)^{-1} + C_1$$

$$EI_{zz} \frac{d^2 v}{dx^2} = M_z(x) = R_{yB}(x-L)^1 - M_{zB}(x-L)^0 + C_1 x + C_2$$

$$EI_{zz} \theta_z = R_{yB} \frac{(x-L)^2}{2} - M_{zB}(x-L)^1 + \frac{C_1 x^2}{2} + C_2 x + C_3$$

$$EI_{zz} v = R_{yB} \frac{(x-L)^3}{6} - M_{zB} \frac{(x-L)^2}{2} + \frac{C_1 x^3}{6} + \frac{C_2 x^2}{2} + C_3 x + C_4$$

$$v(x=0) = C_4 = 0 \Rightarrow C_4 = 0$$

$$\theta_z(x=0) = C_3 = 0 \Rightarrow C_3 = 0$$

$$v(2L) = \frac{R_{yB} L^3}{6} - \frac{M_{zB} L^2}{2} + \frac{C_1 4 L^3}{3} + \frac{C_2 2 L^2}{2} = 0 \quad (1)$$

$$M_z(2L) = R_{yB} L - M_{zB} + 2L C_1 + C_2 = 0 \quad (2)$$

$$v(L) = \frac{C_1 L^3}{6} + \frac{C_2 L^2}{2} = 0 \quad (3)$$

Resolvendo o sistema de equações com 1, 2 e 3 temos o seguinte resultado:

$$C1 = \frac{6M_{3B}}{7L} \quad \text{e} \quad C2 = -\frac{2M_{3B}}{7}$$

Equação de Apoio:

$$V_y(x=0) = \frac{6M_{3B}}{7L} = F_{yA} \quad R_{yB} = -\frac{3M_{3B}}{7L}$$

$$M_z(x=0) = -\frac{2M_{3B}}{7} = M_{3A} \quad V_y(2L) = \frac{3M_{3B}}{7L} = F_{yC}$$

$$c) K_{\theta B} = \frac{M_{3B}}{\theta_{3B}}$$

$$EI_{33} \theta_3(x=L) = -\frac{3M_{3B}}{14L} (L-L)^2 - M_{3B} (L-L)' + \frac{6M_{3B}}{14L} (L)^2 - \frac{2M_{3B}}{7} L$$

$$EI_{33} \theta_3(x=L) = \frac{6M_{3B}L}{14} - \frac{2M_{3B}L}{7} = \frac{M_{3B}L}{7}$$

$$\theta_3(x=L) = \frac{M_{3B}L}{7EI_{33}} ; K_{\theta B} = \frac{M_{3B}}{\theta_{3B}} = \frac{7EI_{33}}{L}$$