EJERCICIOS

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Nombre del tema:

INESTABILIDAD ELASTICA

Parcial: 4°

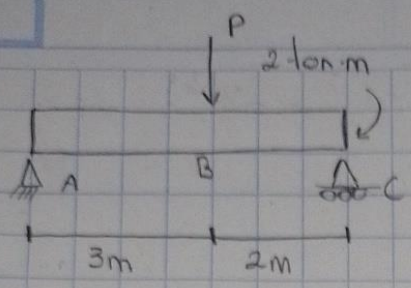
Nombre de la Materia: Análisis De Estructuras

Nombre del profesor: Arq. Perla Marisol Barajas

Nombre de la Licenciatura: Arquitectura

Cuatrimestre: 5to

Fecha: Comitán de Domínguez a 28 de marzo de 2025



Determinar la deflexión en el punto B de la viga

$\sum M_o = 0$

$C_y(5m) - 2\,ton - P(3m) = 0$

$C_y = \frac{2\,ton \cdot m}{5m} - \frac{3m}{5m}$

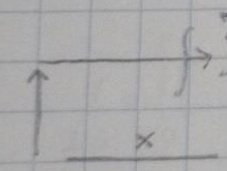
$C_y = 0.4\,ton - 0.6P$

$A_y - P + C_y = 0$

$A_y = P - (0.4\,ton - 0.6P)$

$A_y = 0.4P - 0.4\,ton$

CORTE 1

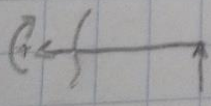


$0.4P - 0.4\,ton$

$M_1 = 0.4P - 0.4\,ton(x)$

$0 \leq x \leq 3$

CORTE 2



$M_2 = 0.4\,ton(x) + 0.6P(x) - 2$

$0 \leq x \leq 2$

$m_1 \quad \frac{\Delta M}{\Delta P} = 0.4x$

$m_2 \quad \frac{\Delta M}{\Delta P} = 0.6x$

FORMULA

$$\Delta = \int_0^L \frac{(M)\left(\frac{\Delta M}{\Delta P}\right)dx}{EI}$$

$$\Delta = \int_0^3 \frac{(-0.4x)(0.4x)dx}{EI} + \int_0^2 \frac{(0.4x-2)(0.6x)dx}{EI}$$

$$\Delta = \int_0^3 (-0.4x)(0.4x)dx = \frac{1}{EI}\int_0^3 (-0.16x^2)dx$$

$$\frac{1}{EI}\left[-0.16\left(\frac{x^{n+1}}{n+1}\right)\right]_0^3 = \frac{1}{EI}\left[-0.16\left(\frac{x^{2+1}}{2+1}\right)\right]_0^3$$

$$\frac{1}{EI}\left[\frac{-0.16x^3}{3}\right]_0^3 = \frac{1}{EI}\left[\frac{-0.053x^3}{1}\right]_0^3$$

$$= \frac{-0.053x^3}{EI} = \frac{-0.053(3)^3}{EI} - \frac{(0.053)(0)^3}{EI}$$

$$= \frac{-0.053(27)}{EI} = \frac{-1.431}{EI}$$

$$\frac{-1.431}{EI} + \int_0^2 (0.1x-2)(0.6x)dx = \frac{1}{EI}\int_0^2 (0.24x^2) - \int_0^2 \frac{(1.2x)}{EI}\,dx$$

$$= \int_0^2 \frac{(0.24x^2)}{EI} = \frac{1}{EI}\left[\frac{0.24x^{2+1}}{2+1}\right]_0^2 = \frac{1}{EI}\left[\frac{0.24x^3}{3}\right]_0^2 = \frac{1}{EI}$$

$$\left[\frac{0.08x^3}{1}\right]_0^3 = \frac{0.08(2)^3}{EI} - \frac{0.08(0)^3}{EI} = \frac{0.08(8)}{EI} = \frac{0.64}{EI}$$

$$\frac{+0.64}{EI}\int_0^2 \frac{(1.2x)}{EI}dx = \frac{1}{EI}\left[\frac{1.2x^{1+1}}{1+1}\right]_0^2 = \frac{1}{EI}\left[\frac{1.2x^2}{2}\right]_0^2$$

$$= \frac{1}{EI}\left[\frac{0.6x^2}{1}\right]_0^2 = \frac{0.6(2)^2}{EI} - \frac{0.6(0)^2}{EI} = \frac{0.6(4)}{EI} = \frac{2.4}{EI}$$

$$\Delta_{VB} = \frac{-1.431}{EI} + \frac{1.76}{EI} = \frac{-3.191}{EI}$$

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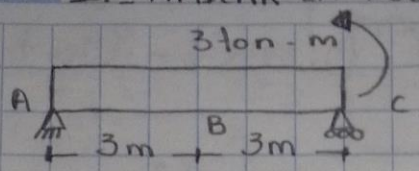
· DETERMINAR LA DEFLEXIÓN EN EL CENTRO DE LA VIGA

1.- APLICAR LA FUERZA "P"



$\sum M_0 = 0$

$C_y(6m) + 3\,TON\cdot m + P(3m) = 0$

$C_y = 3\,TON\cdot m/6m + P(3m/6m)$

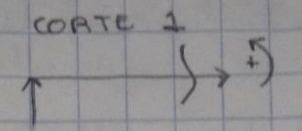
$C_y = -0.5\,TON + 0.5P$

$A_y - P - C_y = 0$

$A_y - P(0.5\,TON + 0.5P)$

$A_y = 0.5p + 0.5\,TON$

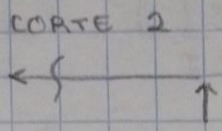
CORTE 1 $\quad 0 \le x \le 3$



$0.5\,TON + 0.5P$

$M_1 = 0.5P(x) - 0.5\,TON(x)$

CORTE 2 $\quad 0 \le x \le 3$



$0.5\,TON - 0.5p$

$M_2 = 0.5\,TON + 0.5p(x)$

FORMULA

$$\Delta = \int_0^L \frac{(m)\left(\frac{\Delta M}{\Delta P}\right)}{EI}\,dx$$

$$\Delta = \int_0^3 \frac{(-0.5x)(0.5x)}{EI}\,dx + \int_0^3 \frac{(-0.5x+3)(0.5x)}{EI}\,dx$$

$$\Delta = \int_0^3 (-0.5x)(0.5x)\,dx = \frac{1}{EI}\int_0^3 (-0.25x^2)\,dx = \frac{1}{EI}\left[-0.25\left(\frac{x^{n+1}}{n+1}\right)\right]_0^3$$

$$\frac{-1}{EI}\left[-0.25\left(\frac{x^{2+1}}{2+1}\right)\right]_0^3 = \frac{1}{EI}\left[\frac{-0.25x^3}{3}\right]_0^3 = \frac{1}{EI}\left[\frac{-0.0833x^3}{1}\right]_0^3$$

$$= \frac{-0.0833x^3}{EI} = \frac{(-0.0833)(3)^3}{EI} - \frac{(0.0833)(0)^3}{EI} = \frac{(-0.0833(27)}{EI}$$

$$= \frac{-2.2491}{EI}$$

$$\frac{-2.2491}{EI} + \int_0^3 \frac{(+0.5x+3)(0.5x)}{EI}\,dx = \frac{1}{EI}\int_0^3 \left(\frac{-0.25x^2}{EI}\right)$$

$$+\int_0^3 \left(\frac{1.5x}{EI}\right)dx$$

$$= \int_0^3 \left(\frac{-0.25x^2}{EI}\right) = \frac{1}{EI}\left[\frac{-0.25x^{2+1}}{2+1}\right]_0^3 = \frac{1}{EI}\left[\frac{-0.25x^3}{3}\right]_0^3$$

$$= \frac{1}{EI}\left[\frac{-0.0833\,x^3}{1}\right]_0^3 = \frac{-0.0833(3)^3}{EI} - \left(\frac{-0.0833(0)^3}{EI}\right)$$

$$= \frac{-0.0833(27)}{EI} = \frac{-2.2491}{EI} + \frac{2.2491}{EI}$$

$$\frac{+2.2491}{EI} + \int_0^3 \frac{(1.5x)}{EI}\,dx = \frac{1}{EI}\left[\frac{1.5x^{1+1}}{1+1}\right]_0^3 = \frac{1}{EI}\left[\frac{1.5x^2}{2}\right]_0^3$$

$$= \frac{1}{EI}\left[\frac{0.75x^2}{1}\right]_0^3 = \frac{0.75(3)^2}{EI} - \frac{0.75(0)^2}{EI} = \frac{0.75(9)}{EI} = \frac{6.75}{EI}$$

$$\Delta_{VD} = \frac{-2.2491}{IE} + \frac{2.2491}{EI} + \frac{6.75}{EI}$$

$$= \frac{6.75}{EI}$$