INESTABILIDAD ELASTICA

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Nombre del tema: INESTABILIDAD ELASTICA
Parcial: 4
Nombre de la Materia: ANALISIS DE ESTRUCTURAS
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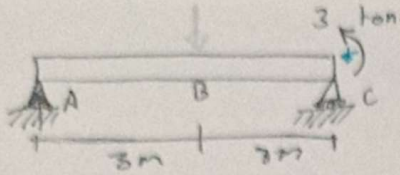
Nombre de la licenciatura: arquitectura
Cuatrimestre: 5



• Determinar la deflexion en el centro de la viga

$\Sigma M_o = 0$

$C_y(6m) + 3\,ton.m - P(3m) = 0$

$C_y(6m) - 3\,ton.m + P(3m) = 0$

$C_y = \frac{3\,ton.m}{6m} - \frac{P(3m)}{6m} = 0$

$C_y = 0.5\,ton + P(0.5) = C_y = 0.5\,ton - 0.5$

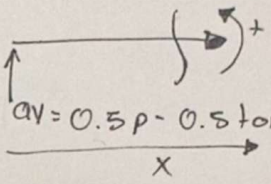
$A_y - P + C_y = 0$

$A_y - P + 0.5\,ton$

$A_y = 0.5P + 0.5\,ton$

Corte ①:

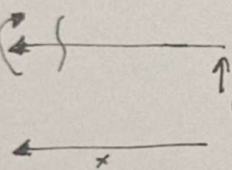
$0 \le x \le 3$



$M_1 = 0.5P(x) + 0.5\,ton(x)$

Corte ②:

$0 \le x \le 3$



$M_2 = 0.5\,ton(x) + 0.5P(x) + 3$

$M_1 = \frac{am}{ap} = 0.5P(x) = 0.5x$

$M_2 = \frac{am}{ap} = 0.5x$

Formula

$\Delta = \int_0^3 \frac{(m)\left(\frac{am}{ap}\right)}{EI}\,dx$

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

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

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

$\frac{1}{EI}\left(\frac{-0.25x^3}{3}\right)\Big|_0^3 = \frac{1}{EI}\left(\frac{-0.083x^3}{1}\right)\Big|_0^3 = \frac{-0.083x^3}{EI}\Big|_0^3 =$

$\frac{0.083(3)^3}{EI} - \frac{0.083(0)^3}{EI} = \frac{-0.083(27)}{EI} =$ • 2.241 ton/m³

$$\Delta = \int \frac{(-0.5x+3)(0.5x)}{EI\ 1.5}\,dx = \frac{1}{EI}\int_0^3 -0.25x^2 + 1.5x^1 = \frac{1}{EI}\left[-0.25\left(\frac{x^{2+1}}{2+1}\right) + 1.5\left(\frac{x^{1+1}}{1+1}\right)\right]$$

$$\frac{1}{EI}\left(\frac{-0.25x^3}{3}\right) + \left(\frac{1.5x^2}{2}\right)\Big|_0^3 \qquad \frac{1}{EI}\left(\frac{-0.083x^3}{1}\right) + \left(\frac{0.75x^2}{1}\right) =$$

$$\frac{-0.083x^3}{EI} + \frac{0.75x^2}{EI}\Big|_0^3 =$$

$$\frac{-0.083(3)^3}{EI} - \frac{0.083(0)^3}{EI} = \frac{0.083(27)}{EI} = -2.241\ ton/m^3 +$$

$$+ 4.509\ ton/m^3$$

$$\frac{0.75(3)^2}{EI} - \frac{0.75(0)^2}{EI} = \frac{6.75}{EI} + 6.75\ ton/m^3$$

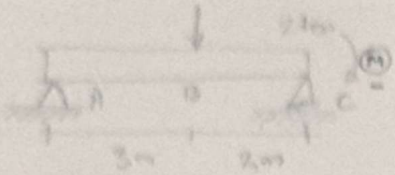
$$\frac{0.75(9)}{EI} =$$

$$-2.241\ ton/m^3 + 4.509\ ton/m^3 =$$

$$2.268\ ton/m^3$$

$$\Delta(2.241 - 2.241 + 6.75 =$$

$$2.241 + 4.509 = 6.75$$



Determinar la deflexión en el Punto B de la viga.

1.- Aplicar carga "P"

$\Sigma M_o = 0$

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

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

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

$C_y = 0.4\,ton - 0.6P$

$A_y - P + C_y = 0$

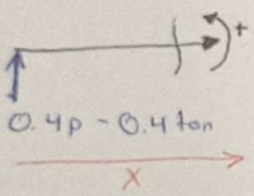
~~$A_y = 0.6 + 0.4 = 0$~~

$A_y = P - (0.6P + 4\,ton)$

~~$A_y = P - (0.2\,ton - P)$~~

$A_y = 0.4P - 0.4\,ton$

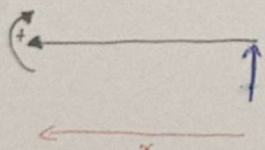
Corte ①:



$0 \leq x \leq 3$

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

Corte ②:



$0 \leq x \leq 2$

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

$M_① = \frac{\partial M}{\partial P} = 0.4x$

$M_② = \frac{\partial M}{\partial P} = 0.6x$

Formula:

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

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

$$\Delta = \int_0^3 \frac{(-0.4x)(0.4x)\,dx}{EI} = \frac{1}{EI}\int_0^3 (-0.16x^2) = \frac{1}{EI}\left[-0.16\frac{x^{2+1}}{2+1}\right]_0^3$$

$$\frac{1}{EI}\left(\frac{-0.16x^3}{3}\right)\Big|_0^3 = \frac{1}{EI}\left(\frac{-0.0533x^3}{1}\right)\Big|_0^3 =$$

$$\frac{-0.0533x^3}{EI}\Big|_0^3 = \frac{0.0533(3)^3}{EI} - \frac{0.0533(0)^3}{EI} = \frac{0.0533(27)}{EI}$$

$$\frac{-1.4391}{EI} = -1.4391 \text{ ton/m}^3$$

$$\Delta = \int_0^2 \frac{(0.4x-2)(0.6x)\,dx}{EI} = \frac{1}{EI}\int_0^2 0.24x^2 - 1.2x = \frac{1}{EI} =$$

$$\frac{1}{EI}\left[\left(0.24\left(\frac{x^{2+1}}{2+1}\right) - 1.2\left(\frac{x^{1+1}}{1+1}\right)\right) = \frac{1}{EI} = \left(\frac{0.24x^3}{3}\right) - \left(\frac{1.2x^2}{2}\right)\Big|_0^2\right.$$

$$\frac{1}{EI} = \frac{0.08x^3}{1} - \frac{0.6x^2}{1} =$$

$$\frac{0.08(2)^3}{EI} - \frac{0.08(0)^3}{EI} = \frac{0.08(8)}{EI} = 0.64 \text{ ton/m}^3$$

$$\frac{0.6(2)^2}{EI} - \frac{0.6(0)^2}{EI} = \frac{0.6(4)}{EI} = -2.4 \text{ ton/m}^3$$

$$\Big\rangle \; -1.76 \text{ ton/m}^3$$

$$-1.4391 + (-1.76) = -3.1991 \text{ ton/m}^3$$