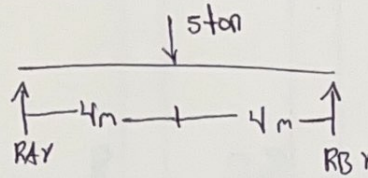


① Diagrama de cuerpo libre



Formula: Estático
A, móvil, F, J, C, P, etc

$$\sum M = 0$$

$$\sum M F_x = 0$$

$$\sum M F_y = 0$$

$$1. \sum F_x = 0$$

$$2. \sum M_x = 0 \quad (\curvearrowright)$$

$$3. + \uparrow \sum F_y = 0$$

$$\sum M_A = -5 \text{ ton}(4\text{m}) + R_{BY}(8) = 0$$

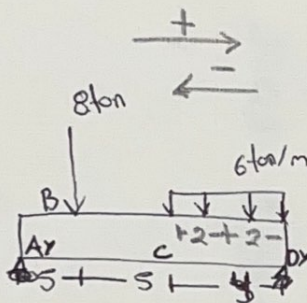
$$-20 \text{ ton}\cdot\text{m} + R_{BY}(8) = 0$$

$$R_{BY} = \frac{20 \text{ ton}\cdot\text{m}}{8 \text{ m}} = 2.5 \text{ ton}$$

$$R_{AY} = -5 \text{ ton} + 2.5 \text{ ton} = 0$$

$$0 = R_{AY} - 2.5 \text{ ton}$$

$$R_{AY} = 2.5 \text{ ton}$$



$$\textcircled{1} \sum F_x = 0$$

$$\textcircled{2} 4 \times 6 \text{ ton/m} = 24 \text{ ton/m}$$

$$\sum M = 0$$

$$\sum M_A = D_Y(14\text{m}) - 24 \text{ ton}(12\text{m}) - 8 \text{ ton}(5\text{m}) = 0$$

$$D_Y(14\text{m}) - 288 \text{ ton}\cdot\text{m} - 40 \text{ ton}\cdot\text{m} = 0$$

$$D_Y(14\text{m}) - 328 \text{ ton}\cdot\text{m} = 0$$

$$D_Y(14\text{m}) = 328 \text{ ton}\cdot\text{m}$$

$$D_Y = \frac{328 \text{ ton}\cdot\text{m}}{14 \text{ m}} = 23.429 \text{ ton}$$

$$D_Y = 23.429 \text{ ton}$$

③

$$\uparrow \sum F_y = 0$$

$$A_Y = -8 \text{ ton} - 24 \text{ ton} + 23.429 \text{ ton} = 8.571 \text{ ton}$$

$$A_Y = -8.571 \text{ ton}$$

$$A_Y = 8.571 \text{ ton}$$

④

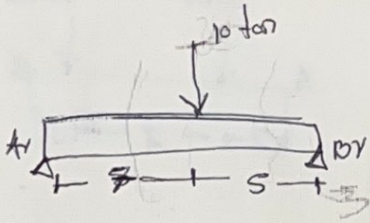
Ecuación de la estática
suma de F

$$8.571 - 8 - 24 + 23.429 = 0$$

sistema real

EI = CAE

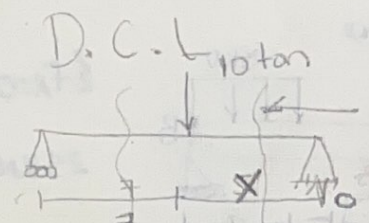
ecuaciones de momentos



$$\sum M_A = -10 \text{ ton}(5\text{m}) + B_y(12\text{m}) = 0$$

$$-50 \text{ ton} + B_y(12\text{m}) = 0$$

$$B_y = \frac{+50 \text{ ton} \cdot \text{m}}{12\text{m}} = 4.166 \text{ ton}$$



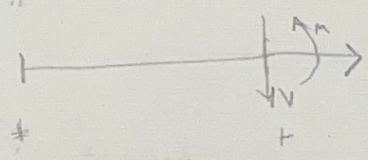
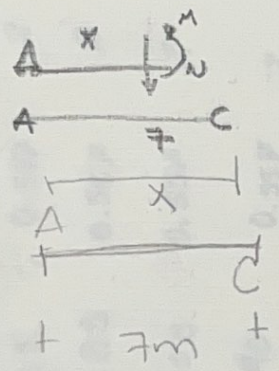
$$A_y = -10 \text{ ton} + 4.166 \text{ ton} = 0$$

$$A_y = -5.834 = 0$$

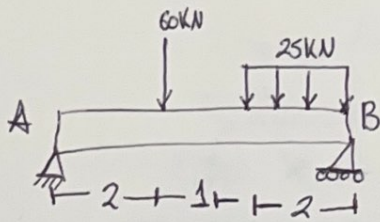
$$A_y = 5.834 \text{ ton}$$

$$A \quad | \quad C \quad | \quad O \quad \xrightarrow{M_1 = 4.166x} \quad \xrightarrow{M_2 = 5.834x - 10(x-z)}$$

$$0 \leq x \leq 12$$

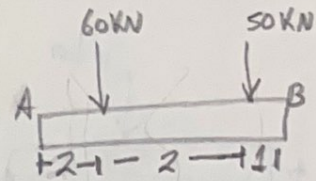


$$M_1 = 4.166$$



$$\sum F_x = 0$$

$$25 \text{ kN} \cdot 2 \text{ m} = 50 \text{ kN} \cdot \text{m}$$



$$\sum M = 0$$

$$\sum M_A = 0 = B_y(5\text{m}) - 50 \text{ kN}(4\text{m}) - 60 \text{ kN}(2\text{m}) = 0$$

$$B_y(5\text{m}) - 200 \text{ kN} \cdot \text{m} - 120 \text{ kN} \cdot \text{m} = 0$$

$$B_y(5\text{m}) = 320 \text{ kN} \cdot \text{m} = 0$$

$$B_y(5\text{m}) = 320 \text{ kN} \cdot \text{m}$$

$$B_y = \frac{320 \text{ kN} \cdot \text{m}}{5\text{m}} = 64 \text{ kN}$$

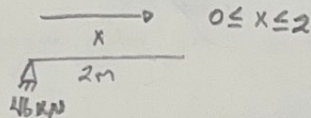
$$\sum F_{Ay} = 0$$

$$A_y = -60 \text{ kN} - 50 \text{ kN} + 64 \text{ kN}$$

$$A_y = -46 \text{ kN}$$

$$A_y = 46 \text{ kN}$$

$$R_{Ax} = -60 \text{ kN}$$



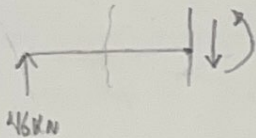
$$0 \leq x \leq 2$$

$$\sum M_O = 46 \text{ kN}(x) = 0$$

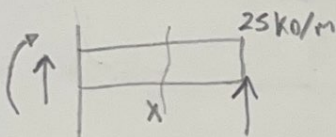
$$M_1 = 46x$$

$$46x - 60x - V_2 = 0$$

$$M_2 = -14 \text{ kN}$$

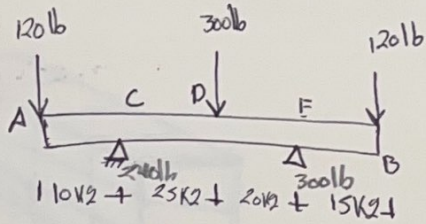


$$46 \text{ kN}$$



$$M_3 = 64x - 25 \text{ kN/m} (x/2)$$

$$M_3 = 64x - 25 \text{ kN} \cdot \text{m} \cdot x^2$$



$$\sum F_x = 0$$

$$C_x = 0$$

$$\sum M_C = 120 \text{ lb} (10 \text{ ft}) - 300 \text{ lb} (25 \text{ ft}) + E_y (45 \text{ ft}) - 120 \text{ lb} (60 \text{ ft})$$

$$1200 \text{ lb} \cdot \text{ft} - 7500 \text{ lb} \cdot \text{ft} + E_y (45 \text{ ft}) - 7200 \text{ lb} \cdot \text{ft}$$

$$E_y (45 \text{ ft}) = 13,500 \text{ lb} \cdot \text{ft}$$

$$E_y = \frac{13,500 \text{ lb} \cdot \text{ft}}{45 \text{ ft}} = 300 \text{ lb}$$

$$\sum F_y = 0$$

$$120 \text{ lb} + C_y - 300 \text{ lb} + 300 \text{ lb} - 120 \text{ lb} = 0$$

$$C_y - 240 \text{ lb} = 0$$

$$C_y = 240 \text{ lb}$$

CORTE 1

$$M = 120 \text{ lb} (x)$$

CORTE 2

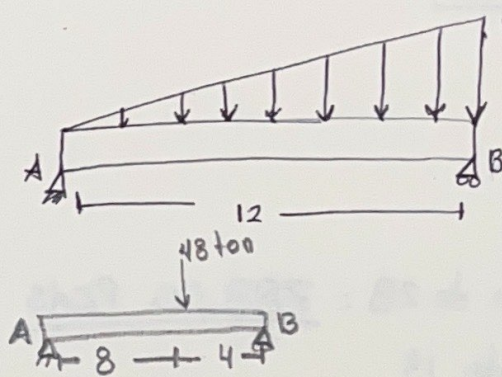
$$M_2 = -120 \text{ lb} (x) + 240 (x - 10 \text{ ft})$$

CORTE 3

$$M_3 = -120 \text{ lb} (x) + 240 \text{ lb} (x - 10 \text{ ft}) - 300 \text{ lb} (x - 35 \text{ ft})$$

CORTE 4

$$M_4 = -120 \text{ lb} (x) + 240 \text{ lb} (x - 10 \text{ ft}) - 300 \text{ lb} (x - 35 \text{ ft}) + 300 \text{ lb} (x - 55 \text{ ft})$$



$w = 8 \text{ ton/m}$
 $8 \text{ ton/m} \cdot 12 \text{ m} / 2 = 48 \text{ ton}$
 Se coloca a $2/3$

$$\sum F_x = 0$$

$$\sum M_A = 0$$

$$B_y = (12 \text{ m}) \cdot 48 \text{ ton/m}^2 (8 \text{ m}) = 0$$

$$B_y (12 \text{ m}) - 384 \text{ ton/m}^2 = 0$$

$$B_y (12 \text{ m}) = 384 \text{ ton/m}^2$$

$$B_y = \frac{384 \text{ ton/m}^2}{12 \text{ m}} = 32 \text{ ton}$$

AY

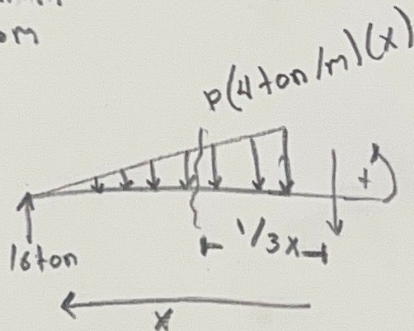
$$\sum F_v = 0$$

$$A_y = -48 \text{ ton} + 32 \text{ ton} = 0$$

$$A_y = -16 \text{ ton}$$

$$A_y = 16 \text{ ton}$$

CORTE 1



P=

$$w = 8 \text{ ton/m}$$

$$P = \frac{(x)(8 \text{ ton/m})}{2}$$

$$P = (4 \text{ ton/m})(x)$$

$$M_1 = 16(x) - P(1/3x)$$

$$M_1 = 16(x) - (4 \text{ ton/m})(x)(1/3x)$$

$$M_1 = 16(x) - 4/3 \text{ ton/m}(x)$$