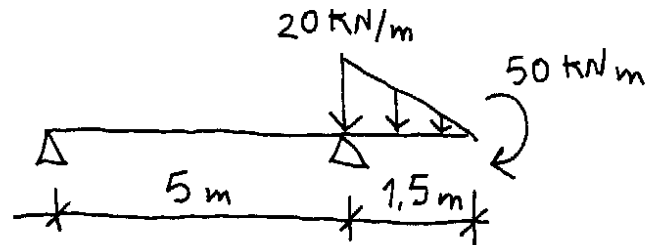
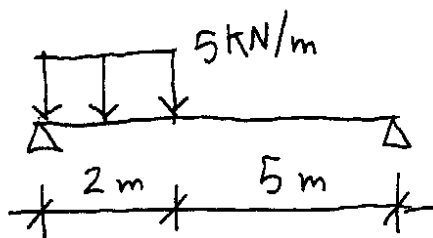


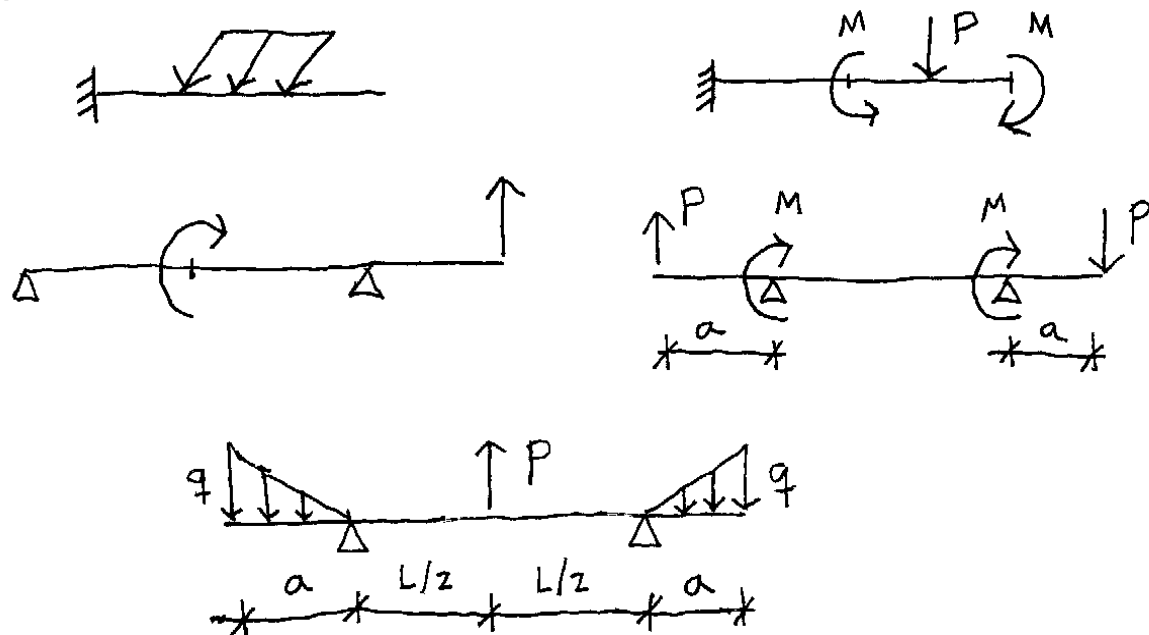
**EXAMEN INTERMEDIO. GRUPOS A Y E 23/NOV/2002**

**EJERCICIO 1**

Calcular las leyes analíticas de esfuerzos cortantes y momentos flectores de las siguientes vigas. Dibujar los diagramas correspondientes.

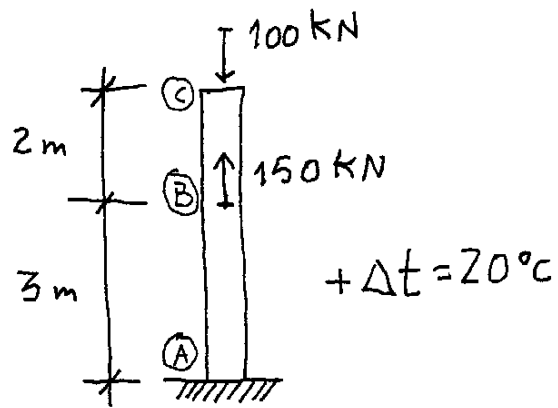


**EJERCICIO 2**



Dibujar a estima los diagramas de esfuerzos y las deformadas de las siguientes vigas.

**EJERCICIO 3**



La barra de la figura tiene un aumento de temperatura de  $20^\circ\text{C}$ . Se pide:

- Tensiones máximas a tracción y a compresión
- Corrimiento vertical en A, B y C

$$E = 2 \times 10^3 \text{ MPa}$$

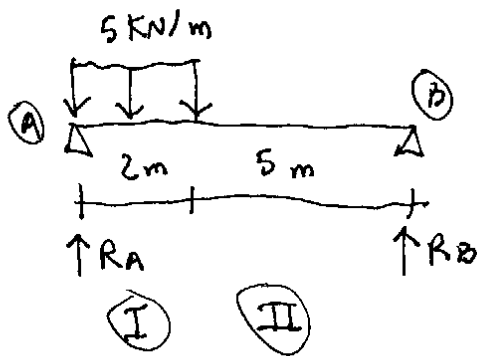
$$A = 20 \times 25 \text{ cm}^2$$

$$\alpha_t = 2 \times 10^{-5} \text{ m / m } ^\circ\text{C}$$

**Tiempo: 2 horas**

# EJERCICIO 1

EXAMEN INTERMEDIO 23/NOV 2003



$$\sum M_A = 0 \rightarrow R_B \cdot 7 = 5 \cdot 2 \cdot 1 \rightarrow R_B = \frac{10}{7} = 1,43$$

$$\sum F_V = 0 \rightarrow R_A = 5 \cdot 2 - R_B = 10 - 1,43 = 8,57$$

Tramo I ( $0 < x < 2$ )

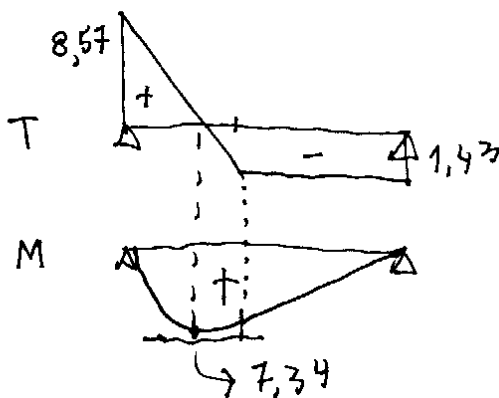
$$T(x) = 8,57 - 5x$$

$$M(x) = 8,57x - \frac{5x^2}{2}$$

Tramo II ( $2 < x < 7$ )

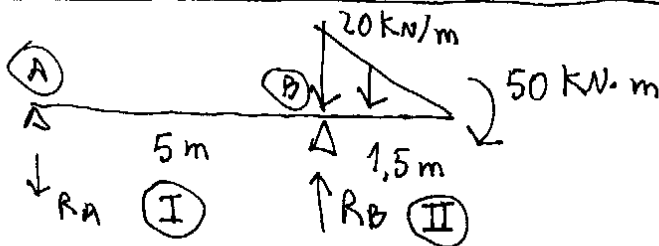
$$T(x) = -1,43$$

$$M(x) = 1,43(7 - x) = 10 - 1,43x$$



$$M_{max} \text{ en } T=0 \rightarrow 8,57 - 5x = 0$$

$$M_{max} = 8,57 \cdot 1,71 = 14,65$$



$$\sum M_A = 0 \rightarrow R_B \cdot 5 = 50 + \frac{20 \cdot 1,5}{2} \left( \frac{1}{3} \cdot 1,5 \right)$$

$$R_B = 26,5 \text{ kN}$$

$$\sum F_V = 0 \rightarrow R_A = 26,5 - \frac{20 \cdot 1,5}{2} = 11,5$$

Tramo I ( $0 < x < 5$ )

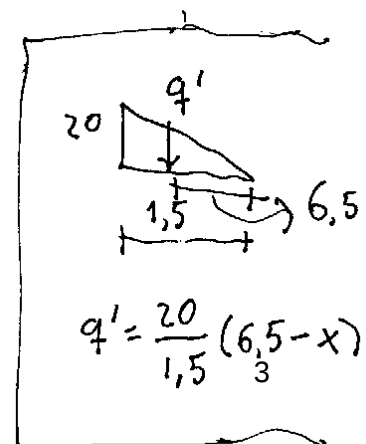
$$T(x) = -11,5$$

$$M(x) = -11,5x$$

Tramo II ( $5 < x < 6,5$ )

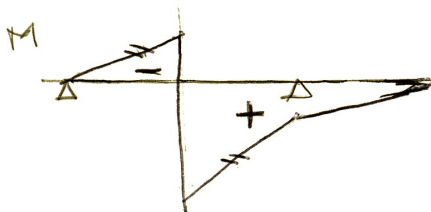
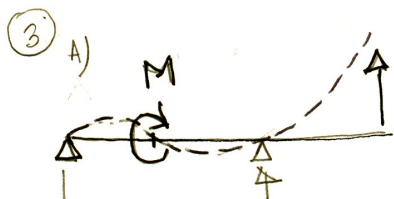
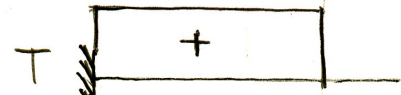
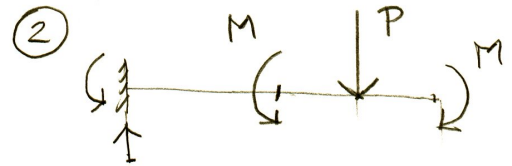
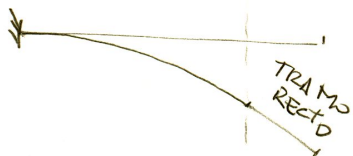
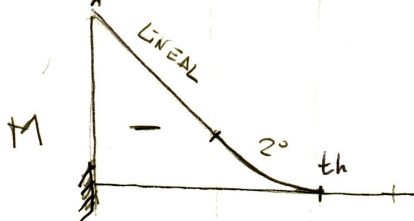
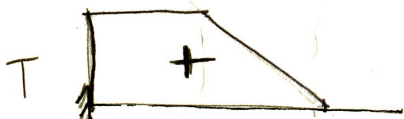
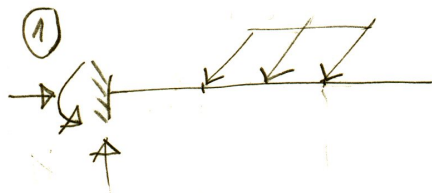
$$T(x) = q' \frac{(6,5 - x)}{2} = \frac{20}{1,5} \frac{(6,5 - x)^2}{2} = 6,67 (6,5 - x)^2$$

$$M(x) = -50 - \frac{6,67}{3} (6,5 - x)^3 + (6,5 - x)$$

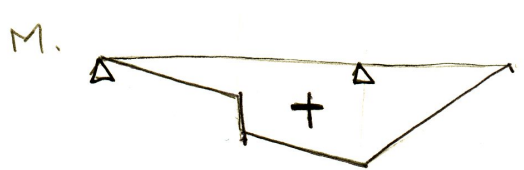
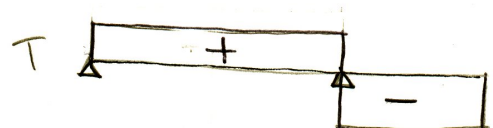
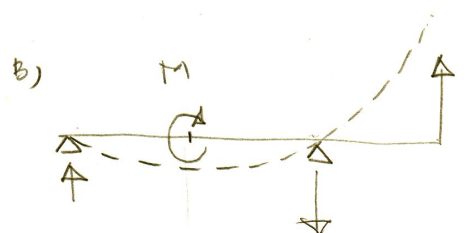


# EXAMEN INTERMEDIO . 23/NOV/2002.

## EXERCÍCIO 2. ESTIMAS.

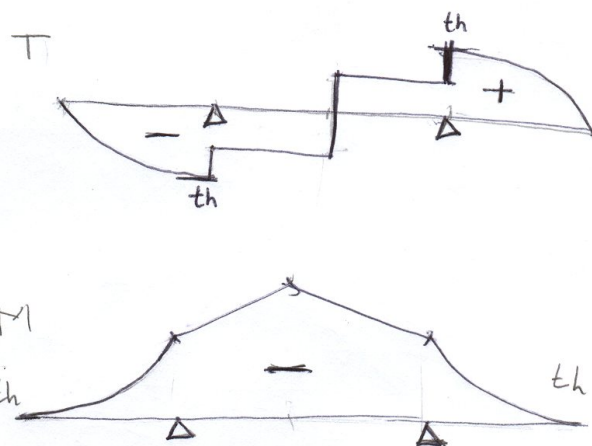
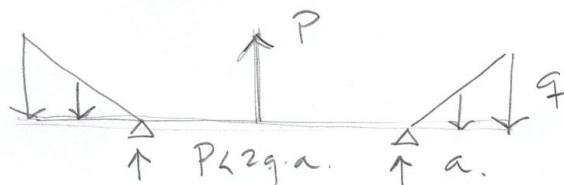
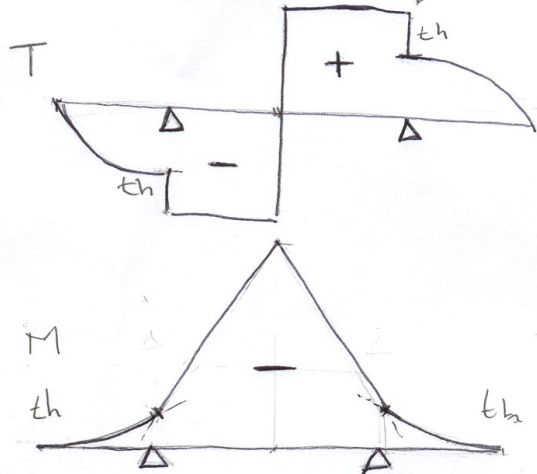
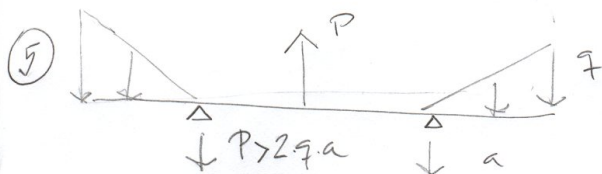
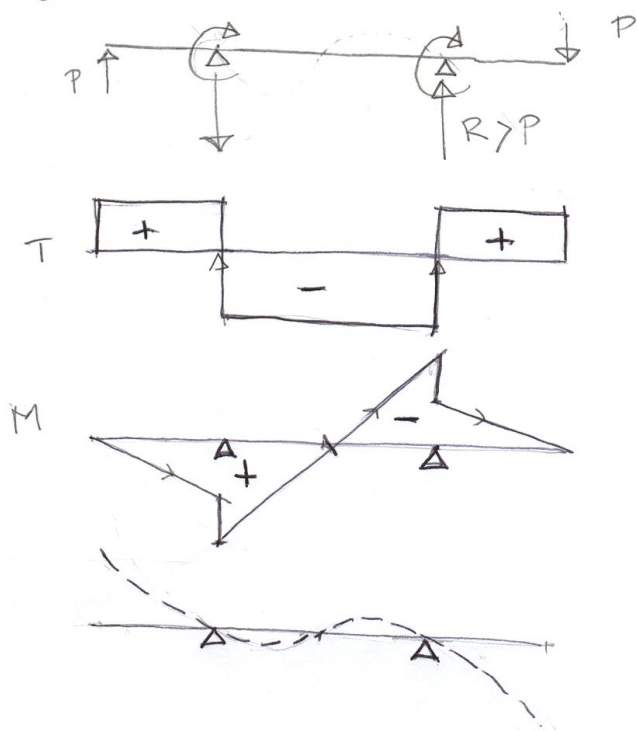


DOS  
POSIBILIDADES



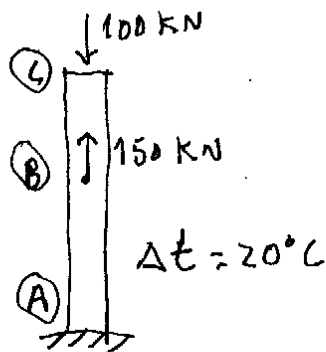
④

EXAMEN INTERMEDIO. 23/NOV/2002. EJ.2. ESTIMAS.



# EJERCICIO 3

EXAMEN INTERMEDIO 23/NOV/2002



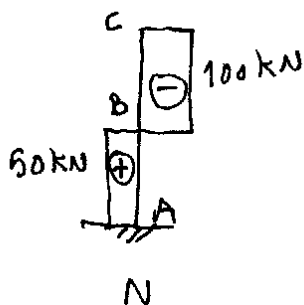
$$E = 2 \times 10^3 \text{ MPa}$$

$$A = 20 \times 25 \text{ cm}^2$$

$$\alpha_t = 2 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

LEY AXILES

TENSIONES NORMALES MAXIMAS



$$\sigma_{\text{max}-c} = \frac{N_{BC}}{A} = \frac{100 \text{ kN}}{20 \times 25 \cdot 10^{-4} \text{ m}^2} = 2.000 \text{ kPa} =$$

$$\sigma_{\text{max}-t} = \frac{N_{AB}}{A} = \frac{50 \text{ kN}}{20 \times 25 \cdot 10^{-4} \text{ m}^2} = 1.000 \text{ kPa} =$$

CORRIMIENTOS VERTICALES

$$V_A = 0 \text{ (empujamiento)}$$

$$V_B = \Delta L_{AB-N} + \Delta L_{AB-T} = \frac{N_{AB} L_{AB}}{EA} + \alpha L_{AB} \Delta t =$$

$$= \frac{50 \text{ kN} \cdot 3 \text{ m}}{2 \cdot 10^3 \cdot 10^3 \text{ kN/m}^2 \cdot 20 \cdot 25 \cdot 10^{-4} \text{ m}^2} + 2 \cdot 10^{-5} \cdot 3 \text{ m} \cdot 20 = 1,5 \cdot 10^{-3} + 1,2$$

$$= 2,7 \cdot 10^{-3} \text{ m} = 2,7 \text{ mm (hacia arriba)}$$

$$V_C = V_B - \Delta L_{CB-N} + \Delta L_{CB-T} = V_B - \frac{N_{BC} L_{BC}}{EA} + \alpha L_{BC} \Delta t =$$

$$= 2,7 \cdot 10^{-3} - \frac{100 \cdot 2}{2 \cdot 10^3 \cdot 10^3 \cdot 20 \cdot 25 \cdot 10^{-4}} + 2 \cdot 10^{-5} \cdot 2 \cdot 20 =$$

$$= 1,5 \cdot 10^{-3} \text{ m} = 1,5 \text{ mm (hacia arriba)}$$