

## Tema 2 - Ejercicio 1:

$$P := 15 \text{ kN}$$

Perfil T 45 x 45 x 4.8

$$L := 2 \text{ m}$$

$$q := 1 \frac{\text{kN}}{\text{m}}$$

$$J_y := 7.07 \text{ cm}^4$$

$$h := 4.5 \text{ cm}$$

$$d_{zg} := 1.23 \text{ cm}$$

$$CS := 1.6$$

$$\sigma_{flpos} := 160 \text{ MPa}$$

$$J_z := 3.44 \text{ cm}^4$$

$$\sigma_{admpos} := \frac{\sigma_{flpos}}{CS} = 100 \text{ MPa}$$

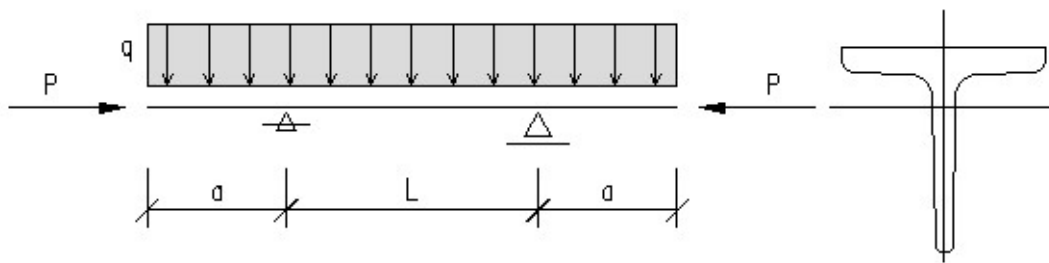
$$\sigma_{flneg} := (-240) \text{ MPa}$$

$$A := 4.13 \text{ cm}^2$$

$$\sigma_{admneg} := \frac{\sigma_{flneg}}{CS} = -150 \text{ MPa}$$

$$E := 210 \text{ GPa}$$

$$a := 0.7 \text{ m}$$



En el apoyo móvil

$$M_y := -\left(q \cdot a \cdot \frac{a}{2}\right) = -0.245 \text{ kN m} \quad M_z := 0 \text{ kN m}$$

$$N := -P = -15 \text{ kN}$$

Las tensiones en cualquier punto:

$$\sigma(yz) = \frac{N}{A} + \frac{M_y \cdot z}{J_y} - \frac{M_z \cdot y}{J_z}$$

Puntos a verificar:

$$z_{sup} := -d_{zg} = -1.23 \text{ cm}$$

$$y_{sup} := 0 \text{ cm} = 0 \text{ cm}$$

$$z_{inf} := (h - d_{zg}) = 3.27 \text{ cm}$$

$$y_{inf} := 0 \text{ cm} = 0 \text{ cm}$$

$$\sigma_{sup} := \frac{N}{A} + \frac{M_y \cdot z_{sup}}{J_y} - \frac{M_z \cdot y_{sup}}{J_z} = 6.3041 \text{ MPa}$$

$$\sigma_{inf} := \frac{N}{A} + \frac{M_y \cdot z_{inf}}{J_y} - \frac{M_z \cdot y_{inf}}{J_z} = -149.6364 \text{ MPa}$$

Linea Neutra:

$$0 = \frac{N}{A} + \frac{M_y \cdot z}{J_y} - \frac{M_z \cdot y}{J_z}$$

Si  $y := 0$ 

$$y_{LN} := -\frac{N \cdot J_y}{A \cdot M_y} = -1.0481 \text{ cm}$$

$$z_{CP} := \frac{M_y}{N} = 1.6333 \text{ cm} \quad y_{CP} := -\frac{M_z}{N} = 0 \text{ cm}$$

En el tramo

$$M_y := q \cdot (a + L \cdot 0.5) \cdot \left( \frac{a + L \cdot 0.5}{2} - a \right) = 0.255 \text{ kN m} \quad M_z := 0 \text{ kN m} \quad N := -P = -15 \text{ kN}$$

Las tensiones en cualquier punto:

$$\sigma(yz) = \frac{N}{A} + \frac{M_y \cdot z}{J_y} - \frac{M_z \cdot y}{J_z}$$

Puntos a verificar:

$$z_{sup} := -d_{zg} = -1.23 \text{ cm} \quad y_{sup} := 0 \text{ cm} = 0 \text{ cm}$$

$$z_{inf} := (h - d_{zg}) = 3.27 \text{ cm} \quad y_{inf} := 0 \text{ cm} = 0 \text{ cm}$$

$$\sigma_{sup} := \frac{N}{A} + \frac{M_y \cdot z_{sup}}{J_y} - \frac{M_z \cdot y_{sup}}{J_z} = -80.6831 \text{ MPa}$$

$$\sigma_{inf} := \frac{N}{A} + \frac{M_y \cdot z_{inf}}{J_y} - \frac{M_z \cdot y_{inf}}{J_z} = 81.6224 \text{ MPa}$$

Linea Neutra:

$$0 = \frac{N}{A} + \frac{M_y \cdot z}{J_y} - \frac{M_z \cdot y}{J_z}$$

Si  $y := 0$

$$y_{LN} := -\frac{N \cdot J_y}{A \cdot M_y} = 1.007 \text{ cm}$$

$$z_{CP} := \frac{M_y}{N} = -1.7 \text{ cm} \quad y_{CP} := -\frac{M_z}{N} = 0 \text{ cm}$$