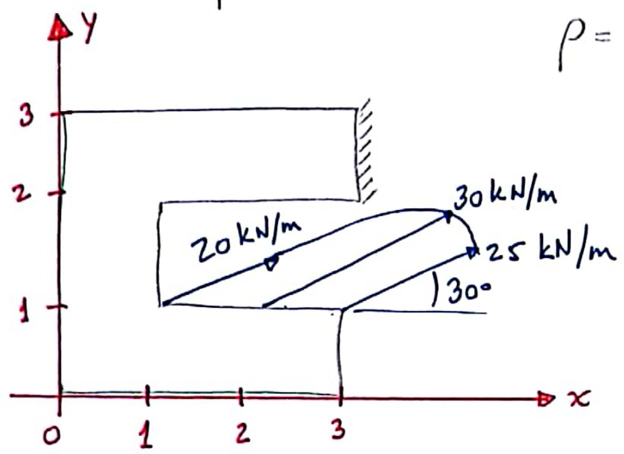
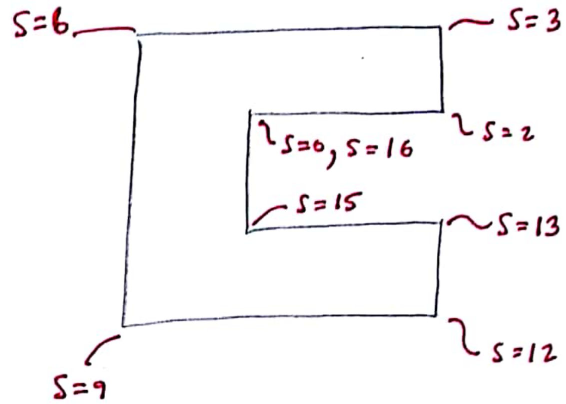
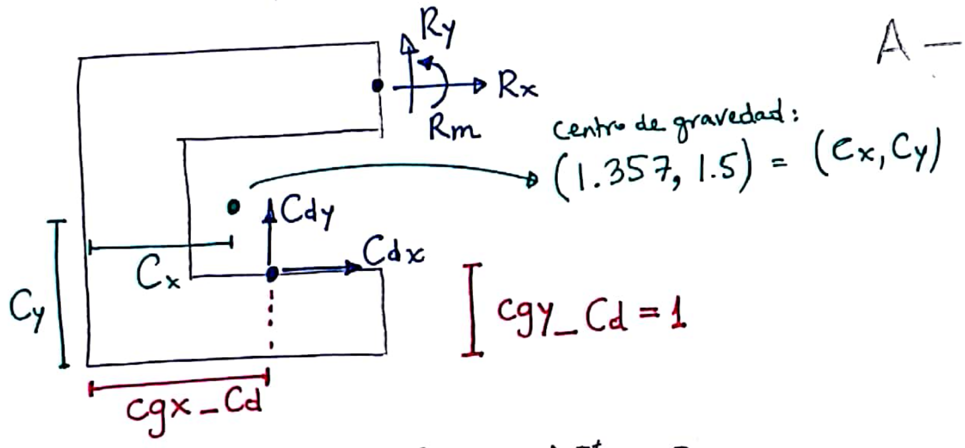
espesor = 1m $\quad E = 210\ GPa \quad \nu = 0.30 \quad \Delta = 0.1m$

$\rho = 1\ kN/m^3$







A — área

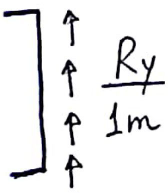
$\sum f_x = 0 \qquad R_x + Cd_x + A\underline{X} = 0$

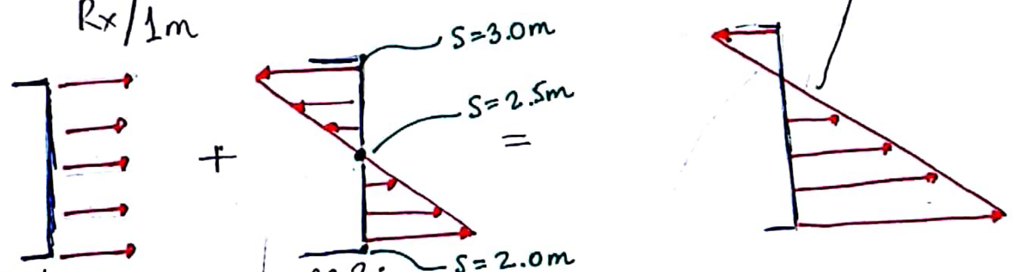
$\sum f_y = 0 \qquad R_y + Cd_y + A\underline{Y} = 0$

$\sum m = 0$ alrededor del punto $(0,0)$. $\qquad R_m + \underline{X}AC_y + \underline{Y}AC_x - Cd_x \cdot cgy\_Cd + Cd_y \cdot cgx\_Cd$
$\qquad - R_x * 2.5 + R_y \cdot 3 = 0$

cdx_apoyo = $ms + b$

Análisis del apoyo





eq1:
$$\int_2^3 (ms+b)\,ds = R_x$$

eq2:
$$\int_2^3 -(ms+b)(s-2.5)\,ds = R_m$$

Se comprueba el equilibrio estático de la estructura.

tiene que dar cero o sino existe un error.

$\Sigma fx = 0$

$$\underbrace{\iint_\Omega X(\underline{x})\, dA}_{XA} + \underbrace{\oint_{\partial\Omega} \bar{X}(s)\, ds}_{\int_0^{16} \bar{X}(s) ds} = 0$$

$\Sigma fy = 0$

$$\underbrace{\iint_\Omega Y(\underline{x})\, dA}_{YA} + \underbrace{\oint_{\partial\Omega} \bar{Y}(s)\, ds}_{\int_0^{16} \bar{Y}(s) ds} = 0$$

recuerde que

$\alpha = \frac{dy}{ds} \rightarrow dy = \alpha ds$

$\beta = -\frac{dx}{ds} \rightarrow dx = -\beta ds$

$\Sigma m = 0$

$$\iint (xY(\underline{x}) - yX(\underline{x}))\, dA + \oint_{\partial\Omega} (x(s)\bar{Y}(s) - y(s)\bar{X}(s))\, ds = 0$$

requiero el teorema de Green para convertir la integral de area en una integral de contorno:

$$\iint_\Omega \left(\frac{\partial g(x,y)}{\partial x} - \frac{\partial f(x,y)}{\partial y} \right) dx dy = \oint_{\partial\Omega} f(x,y)\, dx + \oint_{\partial\Omega} g(x,y)\, dy$$

teorema de Green

Apéndice A.15 main.pdf

en nuestro caso hacemos (dado que X y Y son constantes):

$$\frac{\partial g}{\partial x} = xY \longrightarrow g = \frac{x^2 Y}{2} \qquad \frac{\partial f}{\partial y} = yX \rightarrow f = \frac{y^2 X}{2}$$

$$\iint_\Omega \left(\frac{\partial}{\partial x}\left(\frac{x^2 Y}{2}\right) - \frac{\partial}{\partial y}\left(\frac{y^2 X}{2}\right) \right) dx dy = \oint_{\partial\Omega} \frac{y^2 X}{2} (-\beta) ds + \oint_{\partial\Omega} \frac{x^2 Y}{2} \alpha\, ds$$

$$\oint_{\partial\Omega} \left(-\frac{y^2 X}{2}\beta + \frac{x^2 Y}{2}\alpha + x\bar{Y} - y\bar{X} \right) ds = 0$$

$$\int_0^{16} \left(\frac{x(s)^2 Y}{2}\alpha(s) - \frac{y(s)^2 X}{2}\beta(s) + x(s)\bar{Y}(s) - y(s)\bar{X}(s) \right) ds = 0$$

Se calculan ϕ y sus derivadas en el contorno del sólido

$$\frac{\partial \phi(s)}{\partial y} = +\int \left(\overline{X}(s) - V(s)\,\alpha(s)\right) ds + \cancelto{0}{C_1} \qquad \alpha = \frac{dy}{ds}$$

$$\frac{\partial \phi(s)}{\partial x} = -\int \left(\overline{Y}(s) - V(s)\,\beta(s)\right) ds + \cancelto{0}{C_2} \qquad \beta = -\frac{dx}{ds}$$

$$\phi(s) = \int \frac{\partial \phi}{\partial x} \underbrace{\frac{dx}{ds}}_{-\beta} ds + \int \frac{\partial \phi}{\partial y} \underbrace{\frac{dy}{ds}}_{\alpha} ds + \cancelto{0}{C}$$

En nuestro caso $\quad \overline{X} = 0 \qquad \overline{Y} = -\rho g$

$$\overline{X} = -\frac{dV}{dx} \qquad \overline{Y} = -\frac{dV}{dy}$$

por lo que $\boxed{V = +\rho g y}$

Cálculo del centroide $\longrightarrow$ Ver WIKIPEDIA (en inglés Centroid)

Area $= \quad A = \frac{1}{2} \sum_{i=0}^{n-1} (x_i y_{i+1} - x_{i+1} y_i)$

$$C_x = \frac{1}{6A} \sum_{i=0}^{n-1} (x_i + x_{i+1})(x_i y_{i+1} - x_{i+1} y_i)$$

$$C_y = \frac{1}{6A} \sum_{i=0}^{n-1} (y_i + y_{i+1})(x_i y_{i+1} - x_{i+1} y_i)$$