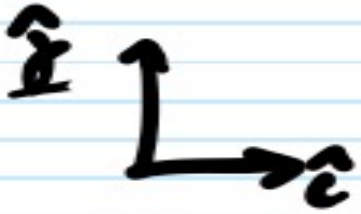
Problema 1



$$\underbrace{\cancel{\frac{dm(V_c)}{dt}}}_{0} = \underbrace{-\int_{\partial V_c} \rho\, v \cdot n\, dS}$$

$$0 = \rho(\bar{V}_2 A_2 - \bar{V}_1 A_1)$$

$$\bar{V}_2 = \bar{V}_1 \frac{A_1}{A_2} = 3{,}36 \text{ m/s}$$

Cons momentum lineal para Vc

$$\cancel{\frac{d}{dt}\int_{V_c}\rho v\, d\overset{\text{volumen}}{V}} \to 0 = -\int_{\partial V_c}\rho v(v\cdot n)\,dS + \int_{\partial V_c}\tau\cdot n\,dS + \cancel{\int_{V_c}\rho b\, dV} \to 0$$

$$\hat{j}:\ 0 = -\{\rho\bar{V}_1^2 A_1 - \rho\bar{V}_2^2 A_2\} + p_1 A_1 - F$$

$$F = \rho\{\bar{V}_1^2 A_1 - \bar{V}_2^2 A_2\} + p_1 A_1$$

$$= 5{,}42\ \mathrm{N}$$

P2)

i)

$T = f/a$

$$[\underline{\underline{T}}'] = \begin{bmatrix} f/a & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$[\underline{\underline{Q}}] = \begin{bmatrix} \cos\theta & \operatorname{sen}\theta & 0 \\ -\operatorname{sen}\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$[\underline{\underline{T}}] = [\underline{\underline{Q}}]^T [\underline{\underline{T}}'] [\underline{\underline{Q}}]$$

$$= \begin{bmatrix} \frac{f}{a}\cos^2\theta & \frac{f}{a}\cos\theta\operatorname{sen}\theta & 0 \\ \frac{f}{a}\cos\theta\operatorname{sen}\theta & \frac{f}{a}\operatorname{sen}^2\theta & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

ii)

$$\underline{\underline{P}} = J\,\underline{\underline{\sigma}}\,\underline{\underline{F}}^{-T}$$

$$\underline{x}(\underline{X}) = \underline{\underline{R}}\,\underline{\underline{U}}\,\underline{X}$$

$$= \begin{bmatrix} \left(\frac{\ell}{L}\cos\theta\right)X - \left(\frac{a}{A}\sin\theta\right)Y \\ \left(\frac{\ell}{L}\sin\theta\right)X + \left(\frac{a}{A}\cos\theta\right)Y \\ Z \end{bmatrix} \begin{pmatrix} \cancel{X} \\ \cancel{Y} \\ \cancel{Z} \end{pmatrix}$$

$$\underline{\underline{F}} = \nabla x = \begin{bmatrix} \frac{\ell}{L}\cos\theta & -\frac{a}{A}\sin\theta & 0 \\ \frac{\ell}{L}\sin\theta & \frac{a}{A}\cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\underline{\underline{F}}^{-T} = \frac{LA}{\ell a}\begin{bmatrix} \frac{a}{A}\cos\theta & -\frac{\ell}{L}\sin\theta & 0 \\ \frac{a}{A}\sin\theta & \frac{\ell}{L}\cos\theta & 0 \\ 0 & 0 & \frac{\ell a}{LA} \end{bmatrix}$$

$$\underline{\underline{P}} = \begin{bmatrix} \frac{f}{A}\cos\theta & 0 & 0 \\ \frac{f}{A}\sin\theta & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

Interpretasi dari $\underline{\underline{P}}$:

$$d\underline{f} = \underline{T}\, dA \quad , \quad \underline{T} = \underline{\underline{P}}\,\underline{N}$$

$$\Rightarrow f = \underline{\underline{P}}\, N\, A$$

$$\underline{N} = \underline{e}_1 = \{1, 0, 0\}$$

$$f = \underline{\underline{P}}\,\underline{N} = \begin{bmatrix} f\cos\theta \\ f\sin\theta \\ 0 \end{bmatrix}$$

iii) $\underline{\underline{S}} = \underline{\underline{F}}^{-1}\underline{\underline{P}} =$

$f_1 = f_2 = \underline{\underline{P}}\,\underline{N} = \underline{\underline{I}}\,\underline{M}$

$\underline{\underline{S}}\,\underline{N}$