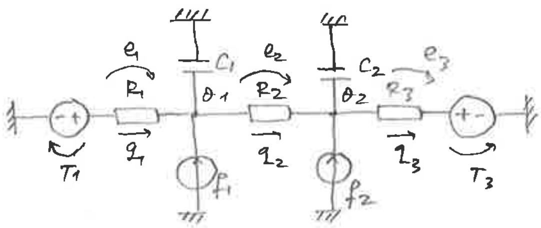
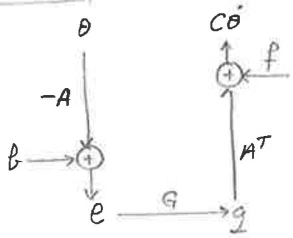
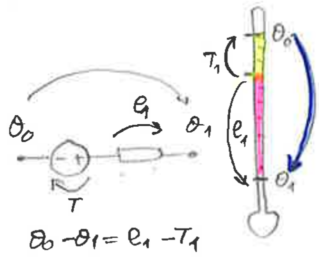
# RESOLUTION CIRCUITS THERMIQUES

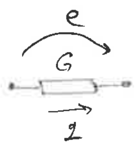


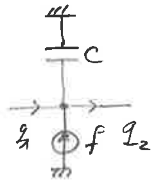

$$\begin{cases} e_1 = T_1 + (0 - \theta_1) \\ e_2 = \theta_1 - \theta_2 \\ e_3 = -T_3 + (\theta_2 - 0) \end{cases} \qquad \begin{bmatrix} e_1 \\ e_2 \\ e_3 \end{bmatrix} = \begin{bmatrix} T_1 \\ 0 \\ -T_3 \end{bmatrix} + \begin{bmatrix} -1 & 0 \\ 1 & -1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix} \qquad e = b - A\theta$$




$$\begin{cases} q_1 = G_1 e_1 \\ q_2 = G_2 e_2 \\ q_3 = G_3 e_3 \end{cases} \qquad \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} = \begin{bmatrix} G_1 & 0 & 0 \\ 0 & G_2 & 0 \\ 0 & 0 & G_3 \end{bmatrix} \begin{bmatrix} e_1 \\ e_2 \\ e_3 \end{bmatrix} \qquad q = Ge$$




$$\begin{cases} C_1 \dot{\theta}_1 = q_1 - q_2 + f_1 \\ C_2 \dot{\theta}_2 = q_2 - q_3 + f_2 \end{cases} \qquad \begin{bmatrix} C_1 & 0 \\ 0 & C_2 \end{bmatrix} \begin{bmatrix} \dot{\theta}_1 \\ \dot{\theta}_2 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} q_1 \\ q_2 \\ q_3 \end{bmatrix} + \begin{bmatrix} f_1 \\ f_2 \end{bmatrix} \qquad C\dot{\theta} = A^T q + f$$

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$$q = Ge = G(b - A\theta)$$

$$C\dot{\theta} = A^T q + f = A^T G(b - A\theta) + f$$

$$\boxed{C\dot{\theta} = -A^T G A \theta + A^T G b + f}$$ dynamique

$$\theta = (A^T G A)^{-1}(A^T G b + f)$$ stationnaire

$$\begin{array}{cc} & \begin{array}{cc} \theta_1 & \theta_2 \end{array} \\ \begin{array}{c} q_1 \\ q_2 \\ q_3 \end{array} & A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \\ 0 & -1 \end{bmatrix} \end{array} \qquad G = \begin{bmatrix} R_1^{-1} & 0 & 0 \\ 0 & R_2^{-1} & 0 \\ 0 & 0 & R_3^{-3} \end{bmatrix} \qquad b = \begin{bmatrix} T_1 \\ 0 \\ -T_3 \end{bmatrix}$$

$$C = \begin{bmatrix} C_1 & 0 \\ 0 & C_2 \end{bmatrix}$$

$$f = [f_1 \quad f_2]^T$$

Note : $R = \frac{e}{\lambda S}$ conduction

$R = \frac{1}{h S}$ convection

$C = mc = \rho V c$