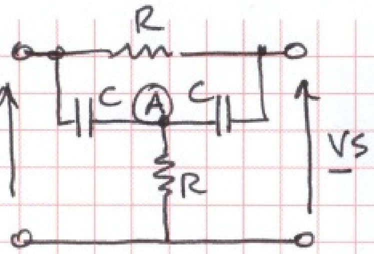
HULK28
pour NECCO

Filtre en "T ponté" coupe-bande*



$$\underline{V_S} = \underline{V_A} + \underline{Z_C}\,\underline{I}$$

$$\underline{I} = \frac{\underline{V_e}-\underline{V_S}}{R}$$

$$\underline{V_S} = \underline{V_A} + \frac{\underline{Z_C}}{R}\left(\underline{V_e}-\underline{V_S}\right) \quad (1)$$

Millmann en A :

$$\underline{V_A} = \frac{R(\underline{V_e}+\underline{V_S})}{2R+\underline{Z_C}} \quad (2)$$

On injecte (2) dans (1)

$$\underline{V_S} = \frac{R(\underline{V_e}+\underline{V_S})}{2R+\underline{Z_C}} + \underline{Z_C}\left(\frac{\underline{V_e}-\underline{V_S}}{R}\right) = \frac{R^2(\underline{V_e}+\underline{V_S}) + \underline{Z_C}(2R+\underline{Z_C})(\underline{V_e}-\underline{V_S})}{R(2R+\underline{Z_C})}$$

$$\Rightarrow \underline{V_S}\left[2R^2+R\underline{Z_C}) - R^2 + 2R\underline{Z_C} + \underline{Z_C}^2\right] = \underline{V_e}\left(R^2+2R\underline{Z_C}+\underline{Z_C}^2\right)$$

$$\Rightarrow \underline{T} = \frac{\underline{V_S}}{\underline{V_e}} = \frac{R^2+\underline{Z_C}(\underline{Z_C}+2R)}{R^2+(3R+\underline{Z_C})\underline{Z_C}} = \frac{R^2+\frac{1}{jC\omega}\left(\frac{1}{jC\omega}+2R\right)}{R^2+\frac{1}{jC\omega}\left(\frac{1}{jC\omega}+3R\right)}$$

$$\Rightarrow \underline{T} = \frac{R^2+\left(\frac{1}{jC\omega}\right)^2+\frac{2R}{jC\omega}}{R^2+\left(\frac{1}{jC\omega}\right)^2+\frac{3R}{jC\omega}} = \frac{1+\left(\frac{1}{jRC\omega}\right)^2+\frac{2}{jRC\omega}}{1+\left(\frac{1}{jRC\omega}\right)^2+\frac{3}{jRC\omega}}$$

$$\Rightarrow \underline{T} = \frac{1+\left(j\frac{\omega_0}{\omega}\right)^2 - j2\left(\frac{\omega_0}{\omega}\right)}{1+\left(j\frac{\omega_0}{\omega}\right)^2 - j3\left(\frac{\omega_0}{\omega}\right)} = \frac{\left(1-j\frac{\omega_0}{\omega}\right)^2}{\left(1-j\frac{\omega_0}{\omega}\right)^2 - j\frac{\omega_0}{\omega}} \quad \left(\text{avec } \omega_0 = \frac{1}{RC}\right)$$

$$\text{Soit } \underline{T} = \frac{1}{1-\dfrac{1}{\dfrac{1}{j\frac{\omega}{\omega_0}} - j\frac{\omega}{\omega_0}}} = \frac{1}{1-\dfrac{1}{-j\left(\frac{\omega_0}{\omega}-\frac{\omega}{\omega_0}\right)}}$$

$$\text{d'où } \boxed{\underline{T} = \frac{1}{1+\dfrac{1}{j\left(\frac{\omega_0}{\omega}-\frac{\omega}{\omega_0}\right)}}}$$

CQFD.