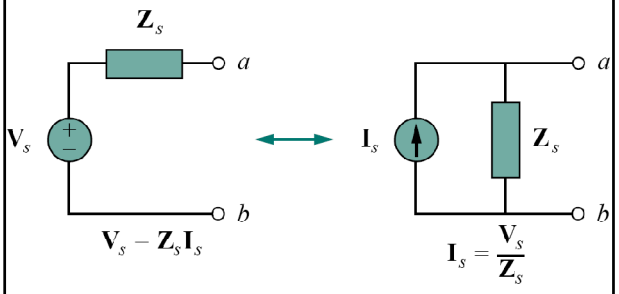
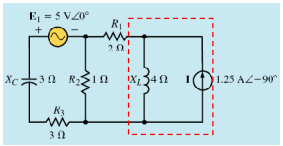
Resolución de Circuitos:

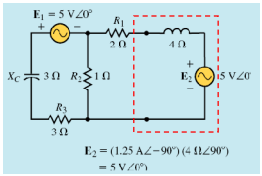
Transformación de Fuentes. Mallas y Nodos

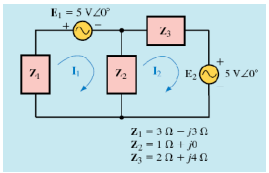
Transformación de Fuentes:





Transformación de Fuentes:





Método de Mallas

$\Sigma V_i = 0$

$-I_1Z_1 - I_1Z_2 + I_2Z_2 - E_1 = 0$

$-I_2Z_2 - I_2Z_3 + I_1Z_2 - E_2 = 0$

Sistema 2x2

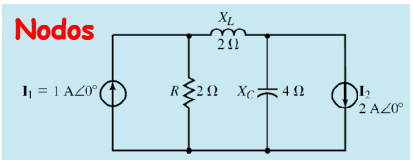
$$I_1 = \frac{\begin{vmatrix} -E_1 & -Z_2 \\ -E_2 & Z_2 + Z_3 \end{vmatrix}}{\begin{vmatrix} Z_1 + Z_2 & -Z_2 \\ -Z_2 & Z_2 + Z_3 \end{vmatrix}} = \frac{(-E_1)(Z_2 + Z_3) - E_2Z_2}{(Z_1 + Z_2)(Z_2 + Z_3) - Z_2Z_2} = \frac{(-E_1)(Z_2 + Z_3) - E_2Z_2}{Z_1Z_2 + Z_1Z_3 + Z_2Z_3}$$

$$I_1 = \frac{-(5)(3 + j4) - (5)(1)}{(3 - j3)(1) + (3 - j3)(2 + j4) + (1)(2 + j4)} = \frac{(-15 - j20) - 5}{(3 - j3) + (6 + j6 - j^2 12) + (2 + j4)} = \frac{-20 - j20}{23 + j7} = \frac{28.28\angle -135^\circ}{24.04\angle 16.93^\circ} = 1.18\,\text{A}\angle -151.93^\circ$$

$$I_2 = \frac{\begin{vmatrix} Z_1 + Z_2 & -E_1 \\ -Z_2 & -E_2 \end{vmatrix}}{\begin{vmatrix} Z_1 + Z_2 & -Z_2 \\ -Z_2 & Z_2 + Z_3 \end{vmatrix}} = \frac{-E_2(Z_1 + Z_2) - E_1Z_2}{(Z_1 + Z_2)(Z_2 + Z_3) - Z_2Z_2} = \frac{-E_2(Z_1 + Z_2) - E_1Z_2}{Z_1Z_2 + Z_1Z_3 + Z_2Z_3}$$

$$I_2 = \frac{-(5)(4 - j3) - (5)(1)}{23 + j7} = \frac{(-20 + j15) - (5)}{23 + j7} = \frac{-25 + j15}{23 + j7} = \frac{29.15\angle 149.04^\circ}{24.04\angle 16.93^\circ} = 1.21\,\text{A}\angle 132.11^\circ$$

Nodos

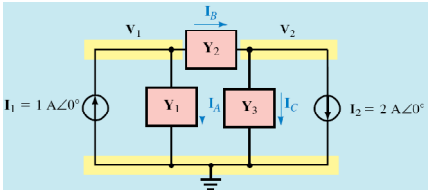


$\Sigma I_i = 0$

$I = V/Z$

$I = VY$

$Y_1 = 0.5\ \text{S}$
$Y_2 = -j\,0.5\ \text{S}$
$Y_3 = +j\,0.25\ \text{S}$



$I_1 - I_A - I_B = 0$ $I_1 - [V_1Y_1] - [(V_1 - V_2)Y_2] = 0$

Node 1: $(Y_1 + Y_2)V_1 - (Y_2)V_2 = I_1$
Node 2: $-(Y_2)V_1 + (Y_2 + Y_3)V_2 = -I_2$

$$V_1 = \frac{\begin{vmatrix} I_1 & -Y_2 \\ -I_2 & Y_2 + Y_3 \end{vmatrix}}{\begin{vmatrix} Y_1 + Y_2 & -Y_2 \\ -Y_2 & Y_2 + Y_3 \end{vmatrix}} = \frac{I_1(Y_2 + Y_3) - I_2Y_2}{Y_1Y_2 + Y_1Y_3 + Y_2Y_3}$$

$$V_1 = \frac{1(-j0.5 + j0.25) - (2)(-j0.5)}{(0.5)(-j0.5) + (0.5)(j0.25) + (-j0.5)(j0.25)} = \frac{j0.75}{0.125 - j0.125} = \frac{0.75\angle 90^\circ}{0.1768\angle -45^\circ} = 4.243\,\text{V}\angle 135^\circ$$

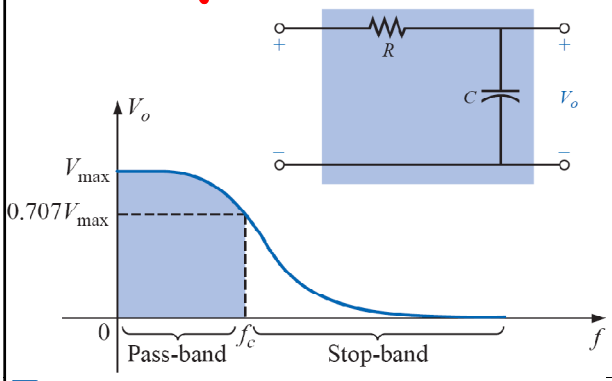
$$V_2 = \frac{\begin{vmatrix} Y_1 + Y_2 & I_1 \\ Y_2 & I_2 \end{vmatrix}}{\begin{vmatrix} Y_1 + Y_2 & -Y_2 \\ -Y_2 & Y_2 + Y_3 \end{vmatrix}} = \frac{-I_2(Y_1 + Y_2) + I_1Y_2}{Y_1Y_2 + Y_1Y_3 + Y_2Y_3}$$

$$V_2 = \frac{-2(0.5 - j0.5) + (1)(-j0.5)}{(0.5)(-j0.5) + (0.5)(j0.25) + (-j0.5)(j0.25)} = \frac{-1 + j0.5}{0.125 - j0.125} = \frac{1.118\angle 153.43^\circ}{0.1768\angle -45^\circ} = 6.324\,\text{V}\angle 198.43^\circ = 6.324\,\text{V}\angle -161.57^\circ$$

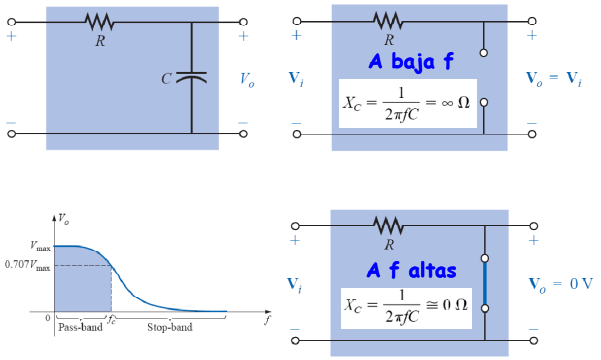
Filtros Pasivos

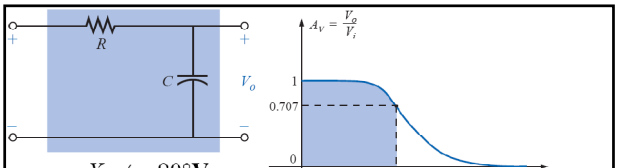
Cualquier combinación de elementos pasivos (R, L y C) diseñados para seleccionar o rechazar una banda de frecuencias se denomina filtro pasivo.

Filtro Pasa bajas:



Filtro Pasa bajas:





$$\mathbf{V}_o = \frac{X_C \angle -90° \mathbf{V}_i}{R - jX_C}$$

$$\mathbf{A}_V = \frac{\mathbf{V}_o}{\mathbf{V}_i} = \frac{X_C \angle -90°}{R - jX_C} = \frac{X_C \angle -90°}{\sqrt{R^2 + X_C^2} \angle -\tan^{-1}(X_C/R)}$$

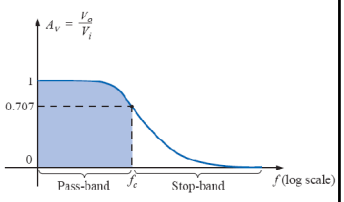
$$A_v = \frac{V_o}{V_i} = \frac{X_C}{\sqrt{R^2 + X_C^2}} = \frac{1}{\sqrt{\left(\frac{R}{X_C}\right)^2 + 1}}$$

Frecuencia de Corte:

$$X_C = R$$

$$\frac{1}{2\pi f_c C} = R \qquad f_c = \frac{1}{2\pi RC}$$

$$A_v = \frac{V_o}{V_i} = \frac{1}{\sqrt{\left(\frac{R}{X_C}\right)^2 + 1}} = \frac{1}{\sqrt{1+1}} = \frac{1}{\sqrt{2}} = 0.707$$



Ejemplo: