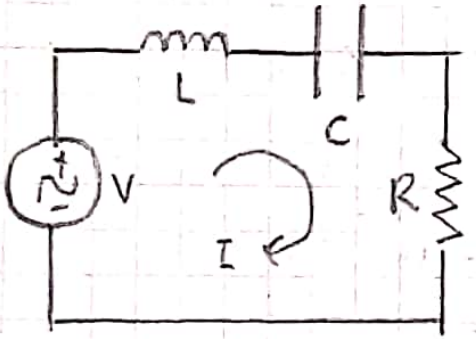
SOLUCIONES INTEGRALES PARA EL CONSTRUCTOR

LABORATORIO 3 AC: "FASORES".

$V = 10\angle 0°$ $R = 100\,\Omega$ $L = 100\,MH$ $C = 10\,nF$



MALLA I $\Rightarrow V = V_L + V_C + V_R$

$L\frac{dI}{dt} + \frac{1}{C}\int I\,dt + IR = V$

$\left(LSI + \frac{1}{C}\left(\frac{1}{S}\right)I + IR = V\right)(S)$

$\left(LS^2I + \frac{1}{C}I + RSI = SV\right) \div L$

$\frac{d^2I}{dt^2} + \frac{R}{L}\frac{dI}{dt} + \frac{1}{LC}I = \frac{dV}{dt}$

$W_0^2 = \frac{1}{LC} \Rightarrow W_0 = \frac{1}{\sqrt{LC}} \Rightarrow W_0 = \frac{1}{\sqrt{(100\times10^{-6})(10\times10^{-9})}} \Rightarrow W_0 = 1000000$

$W_0 = 2\pi f \Rightarrow f = \frac{W_0}{2\pi} \Rightarrow f = \frac{1000000}{2\pi} = 159154.9431\,Hz$

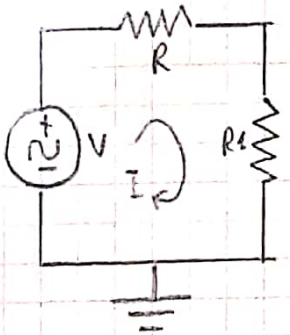
$T = \frac{1}{f} \Rightarrow T = \frac{1}{159154.9431} \Rightarrow T = 6.28\times10^{-6}\,s$

$f_1 = \frac{f}{10} \Rightarrow f_1 = \frac{159154.9431}{10} \Rightarrow f_1 = 15915.49431\,Hz$

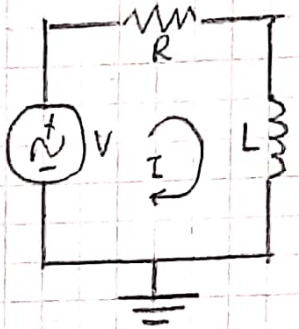
$T_1 = \frac{1}{f_1} \Rightarrow T_1 = \frac{1}{15915.49431} \Rightarrow T_1 = 62.8\times10^{-6}\,s$

① Calcule las corrientes expresadas en fasores

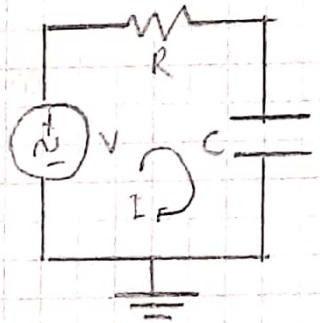
② Calcule el voltaje de salida en fasores



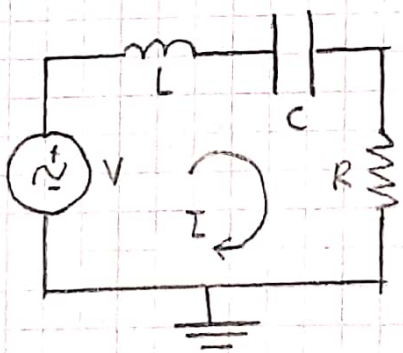
CIRCUITO #1.
RESISTIVO



CIRCUITO #2.
INDUCTIVO.



CIRCUITO #3.
CAPACITIVO



CIRCUITO #4.
RLC SERIE

#1. $V| = 10\angle 0°$ $\quad R = R_1 = 100\Omega$

HALLA $I \Rightarrow V| = V|_R + V|_{R_1}$

$V| = R\,I| + R_1\,I|$

$V| = I|\,(R + R_1)$

$\frac{V|}{R + R_1} = I|$

$\frac{10\angle 0°}{(100 + 100)\angle 0°} = I|$

$\frac{10}{200}\angle 0° = I|$

$\frac{1}{20}\angle 0° = I|$

Resistencia Fase 0°

SOLUCIONES INTEGRALES PARA EL CONSTRUCTOR

$i = \frac{1}{20}\cos(1000000t + 0°) = \frac{1}{20}\cos(1000000t)$

$V_S = RI \Rightarrow V_S = (100\angle 0°)\left(\frac{1}{20}\angle 0°\right) \Rightarrow V_S = 5\angle 0°$

H2: $V = 10\angle 0°$ $R = 100\Omega$ $L = 100\mu H$

INDUCTANCIA FASE 90°

HALLA $I \Rightarrow V = V_R + V_L$

$V = RI + j\omega LI$

$V = I(R + j\omega L)$

$\frac{V}{R + j\omega L} = I$

$\frac{10\angle 0°}{\sqrt{20000}\angle 45°} = I$

$\frac{10}{\sqrt{20000}}\angle -45° = I$

$i = \frac{10}{\sqrt{20000}}\cos(1000000t - 45°)$

$|R + j\omega L| = \sqrt{R^2 + (\omega L)^2} = \sqrt{(100)^2 + [(1000000)(100 \times 10^{-6})]^2} = \sqrt{20000}$

$\theta = \tan^{-1}\left(\frac{\omega L}{R}\right) = \tan^{-1}\left(\frac{(1000000)(100 \times 10^{-6})}{100}\right) = 45°$

$V_S = j\omega LI \Rightarrow V_S = (1000000)(100 \times 10^{-6})\angle 90°\left(\frac{10}{\sqrt{20000}}\angle -45°\right) = \frac{1000}{\sqrt{20000}}\angle 45°$

H3: $V = 10\angle 0°$ $R = 100\Omega$ $C = 10nF$

CAPACITOR FASE -90°

HALLA $I \Rightarrow V = V_R + V_C$

$V = RI + \frac{-j}{\omega C}I$

$V = I\left(R + \frac{-j}{\omega C}\right)$

$\frac{V}{R + \frac{-j}{\omega C}} = I$

$\frac{10\angle 0°}{\sqrt{20000}\angle -45°} = I$

$\frac{10}{\sqrt{20000}}\angle 45° = I$

$i = \frac{10}{\sqrt{20000}}\cos(1000000t + 45°)$

$\left|R + \frac{-j}{\omega C}\right| = \sqrt{R^2 + \left(\frac{-1}{\omega C}\right)^2} = \sqrt{(100)^2 + \left(\frac{-1}{(1000000)(10 \times 10^{-9})}\right)^2} = \sqrt{20000}$

$\theta = \tan^{-1}\left(\frac{-1/\omega C}{R}\right) = \tan^{-1}\left(\frac{-1/(1000000)(10 \times 10^{-9})}{100}\right) = -45°$

$V_1 = 10\angle 0°$ $\quad R = 100\Omega$ $\quad L = 100\,mH$ $\quad C = 10nF$

HALLA $I = \lambda$

$V_1 = V_L + V_C + V_R$

#4

$V_1 = j\omega L I_1 + \frac{-j}{\omega C} I_1 + R I_1$

$V_1 = I_1 \left(j\omega L + \frac{-j}{\omega C} + R \right)$

$\frac{V_1}{j\omega L + \frac{-j}{\omega C} + R} = I_1$

$10\angle 0° = I_1$

$100\angle 0°$

$\frac{1}{10}\angle 0° = I_1$

RESISTENCIA FASE $0°$

$i = \frac{1}{10} \cos(1000000t + 10°)$

$i = \frac{1}{10} \cos(1000000t)$

$R + j\omega L + \frac{-j}{\omega C} = 100 + j(1000000)(100 \times 10^{-6}) + -j\left(\frac{1}{(1000000)(10 \times 10^{-9})} \right)$

$R + j\omega L + \frac{-j}{\omega C} = 100 + j100 - j100 = 100 \Rightarrow$ R que tiene fase $0°$