

ELECTRONICA A. T-5

COMPONENTES PASIVOS EN CORRIENTE ALTERNA

1. Parámetros de CA

a) PERIODO: T [s] tiempo de 1 ciclo $T = \frac{1}{f}$

b) FRECUENCIA: f [Hz] nº de ciclos en 1 segundo $f = \frac{1}{T}$

c) TENSION INSTANTANEA $E_i = E_M \cdot \text{sen}(2\pi f t)$

d) V_{pp} [V] $V_{pp} = 2V_p$; $V_{pp} = 2\sqrt{2} V_{ef}$

e) $V_p = \frac{V_{pp}}{2}$; $V_p = \sqrt{2} \cdot V_{ef}$; $V_p \equiv E_M$

f) $V_{ef} = \frac{V_p}{\sqrt{2}}$; $V_{ef} = \frac{V_{pp}}{2\sqrt{2}}$

g) LONGITUD DE ONDA λ [m]; $\lambda = \frac{\text{Velocidad Luz}}{f} = \frac{300 \cdot 10^6}{f}$

* Para hacer cálculos calculadora modo "RADIANES" RAD

EJEMPLO:

b) $f = 20 \text{ KHz}$; $V_p = 4 \text{ V}$ d parámetros de a) ... g) $E_i(t = \frac{1}{3} T)$

a) $T = \frac{1}{f} = \frac{1}{20 \cdot 10^3} = 50 \cdot 10^{-6} \text{ s} = 50 \mu\text{s}$

g) $\lambda = \frac{V_{\text{luz}}}{f} = \frac{300 \cdot 10^6}{20 \cdot 10^3} = 15000 \text{ m} = 15 \text{ km}$

d) $V_{pp} = 2V_p = 4 \cdot 2 = 8 \text{ V}$

f) $V_{ef} = \frac{V_p}{\sqrt{2}} = \frac{4}{\sqrt{2}} = 2,82 \text{ V}$

c) $E_i(t = \frac{1}{3} T)$; $t = \frac{50 \mu\text{s}}{3} = 16,66 \mu\text{s}$

$$E_i = E_M \cdot \text{sen}(2\pi f t) = 4 \cdot \text{sen}(2\pi \cdot 20 \cdot 10^3 \cdot 16,66 \cdot 10^{-6}) = 3,46 \text{ V}$$

* Realiza el P-1 y P-2 ENTREGA EL VIERNES

P-1 $V_p = 2 \text{ V}$; $f = 10 \text{ KHz}$; P-2 $V_{ef} = 400 \text{ mV}$; $T = 10 \mu\text{s}$

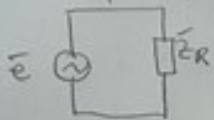
EA T6

2. \bar{Z}_R [Ω] Impedancia que presenta una Resistencia en conexión a tensión alterna

Ejemplo:

$R = 10 \Omega$; $\bar{Z}_R = (R + j0) \Omega = (10 + j0) \Omega$ en forma

$\bar{e} = 10 \angle 0^\circ$ Rectangular o binómica
 $f = 50 \text{ Hz}$ $10 \angle 0^\circ$ en forma polar

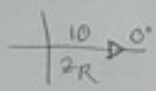


$\Delta DZ, DI, Df, DP$ D = Diagrama

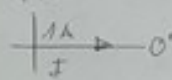
$\bar{i}_R = \frac{\bar{e}}{\bar{Z}_R} = \frac{10 \angle 0^\circ}{10 \angle 0^\circ} = 1 \text{ A} \angle 0^\circ$ (\div coeficientes, (-) ángulos)

$P_R = |i|^2 \cdot |Z_R| = 1^2 \cdot 10 = 10 \text{ W}$; $\bar{V}_R = \bar{e}_R = \bar{e} = 10 \angle 0^\circ$

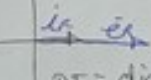
\overline{DZ}



\overline{DI}

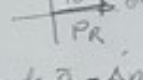


\overline{Df}



$\phi = \frac{10}{2} - \frac{10}{-iR} = 0 - 0 = 0^\circ$

\overline{DP}



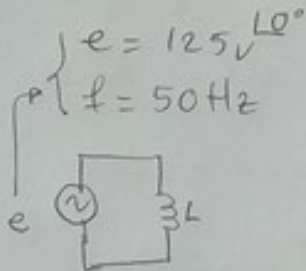
\overline{Df} = diagrama fasorial es $\phi = \text{ángulo } \bar{e} - \text{ángulo } \bar{i}$

Potencia Activa, $P_T = |V_R| |i_R| \cos \phi = 10 \cdot 1 \cos(0) = 10 \text{ W}$

* OJO Calculadora en modo "DEG"

3. Bobinas L; $\bar{Z}_L = (0 + jX_L) = (0 + j\omega L) = (0 + j2\pi f L) \Omega$

Ejemplo: Actividad resuelta 6.10



$L = 200 \text{ mH}$ $\Delta DZ, DI, DF, DQ$

\rightarrow reactancia inductiva
 $X_L = 2\pi f L = 2\pi \cdot 50 \cdot 200 \cdot 10^{-3} = 62,83 \Omega$

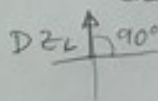
$\bar{Z}_L = (0 + j62,83) \Omega$ en forma rectangular

$Z_L = 62,83 \angle 90^\circ \Omega$ en forma polar

$\bar{i}_L = \frac{\bar{e}}{Z_L} = \frac{125 \angle 0^\circ}{62,83 \angle 90^\circ} = 1,9894 \angle [0-90] = 1,9894 \angle -90^\circ$

$Q_L \equiv$ Potencia reactiva de L [VAR] No es vectorial, No ángulo

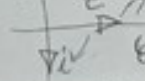
$Q_L = |Z_L| \cdot |i_L|^2 = X_L \cdot |i_L|^2 = 62,83 \cdot 1,9894^2 = 248,6795 \text{ VAR}$



\overline{DI}



\overline{Df}



$\bar{i} \rightarrow$ retrasado $90^\circ \rightarrow \bar{e}$

$\phi = \frac{10}{e} - \frac{10}{i} = 0 - (-90) = 90^\circ$

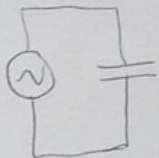
\overline{DQ}



EA T-6

4. CIRCUITO CON CONDENSADOR

Ejemplo 6.11 Datos: $\bar{e} = 230 \overset{10}{V}$, $f = 50 \text{ Hz}$, $C = 75 \mu\text{F}$
 ¿DZ, DI, DF, DG?



$$\bar{Z}_C = (0 - jX_C) = \left(0 - j \frac{1}{2\pi f C}\right) \Omega$$

$$X_C = \frac{1}{2\pi f C} = \frac{1}{2\pi \cdot 50 \cdot 75 \cdot 10^{-6}} = 42,44 \Omega$$

$\bar{Z}_C = (0 - j42,44) \Omega$ en forma rectangular

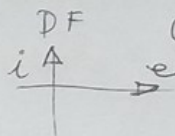
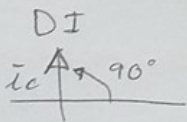
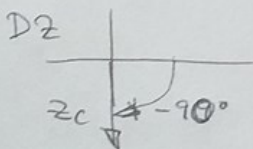
$\bar{Z}_C = (42,44 \overset{-90}{\Omega})$ en " polar

$$\bar{i}_C = \frac{\bar{e}}{\bar{Z}_C} = \frac{230 \overset{10}}{42,44 \overset{-90}} = 5,4192 \text{ A}$$

$\overset{190^\circ}{\rightarrow} (0 - (-90)) = +90^\circ$

$Q_C = \text{potencia reactiva de } C$

$$Q_C = |Z_C| \cdot |i_C|^2 = X_C \cdot |i_C|^2 = 42,44 \cdot 5,4192^2 = 1246,42 \text{ VAR}$$



$$\phi = e^{\overset{10}{\angle}} - i^{\overset{90}{\angle}} = 0 - 90 = -90^\circ$$

Problemas para entregar el viernes

P-3 $\Rightarrow R = 6 \Omega$; $\bar{e} = 12 \overset{10}{V}$ En todas
 ¿DZ, DI, DF, P?

P-4 $\Rightarrow R = 1 \text{ k}\Omega$; $e = 10 \overset{45}{V}$

P-5 $\Rightarrow L = 200 \text{ mH}$ $\bar{e} = 251,3274123 \overset{10}{V}$ $f = 200 \text{ Hz}$

P-6 $\Rightarrow L = 2 \text{ mH}$ $\bar{e} = 251,3274125 \overset{190}{V}$ $f = 200 \text{ Hz}$

P-7 $\Rightarrow C = 100 \mu\text{F}$ $\bar{e} = 15,91549431 \overset{10}{V}$ $f = 100 \text{ Hz}$

P-8 $\Rightarrow C = 100 \mu\text{F}$ $\bar{e} = 15,91549431 \overset{10}{V}$ $f = 1000 \text{ Hz}$