ITSSAT

INSTITUTO TECNOLÓGICO SUPERIOR DE SAN ANDRES TUXTLA

DIVISIÓN DE INGENIERÍA MECATRÓNICA 411-B

ANÁLISIS DE CIRCUITOS ELÉCTRICOS

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PORTAFOLIO DE EVIDENCIAS UNIDAD 3

SAN ANDRÉS TUXTLA 31-05-2023

Exposición de la unidad 3: Resolución de problema 9.46 del libro de Fundamentos de circuitos eléctricos 5ta edición.

9.46 Si $i_s = 5\cos(10t + 40°)$ A en el circuito de la figura 9.53, halle i_o.

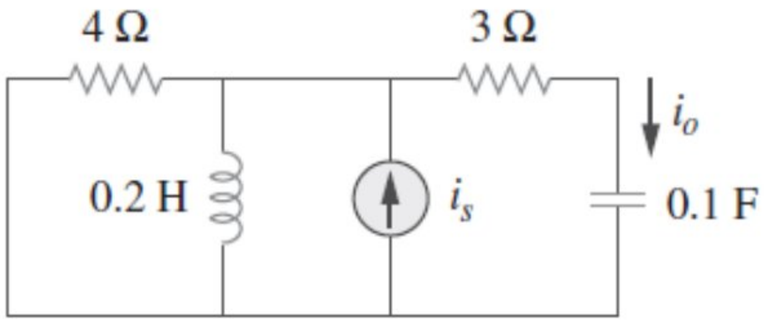
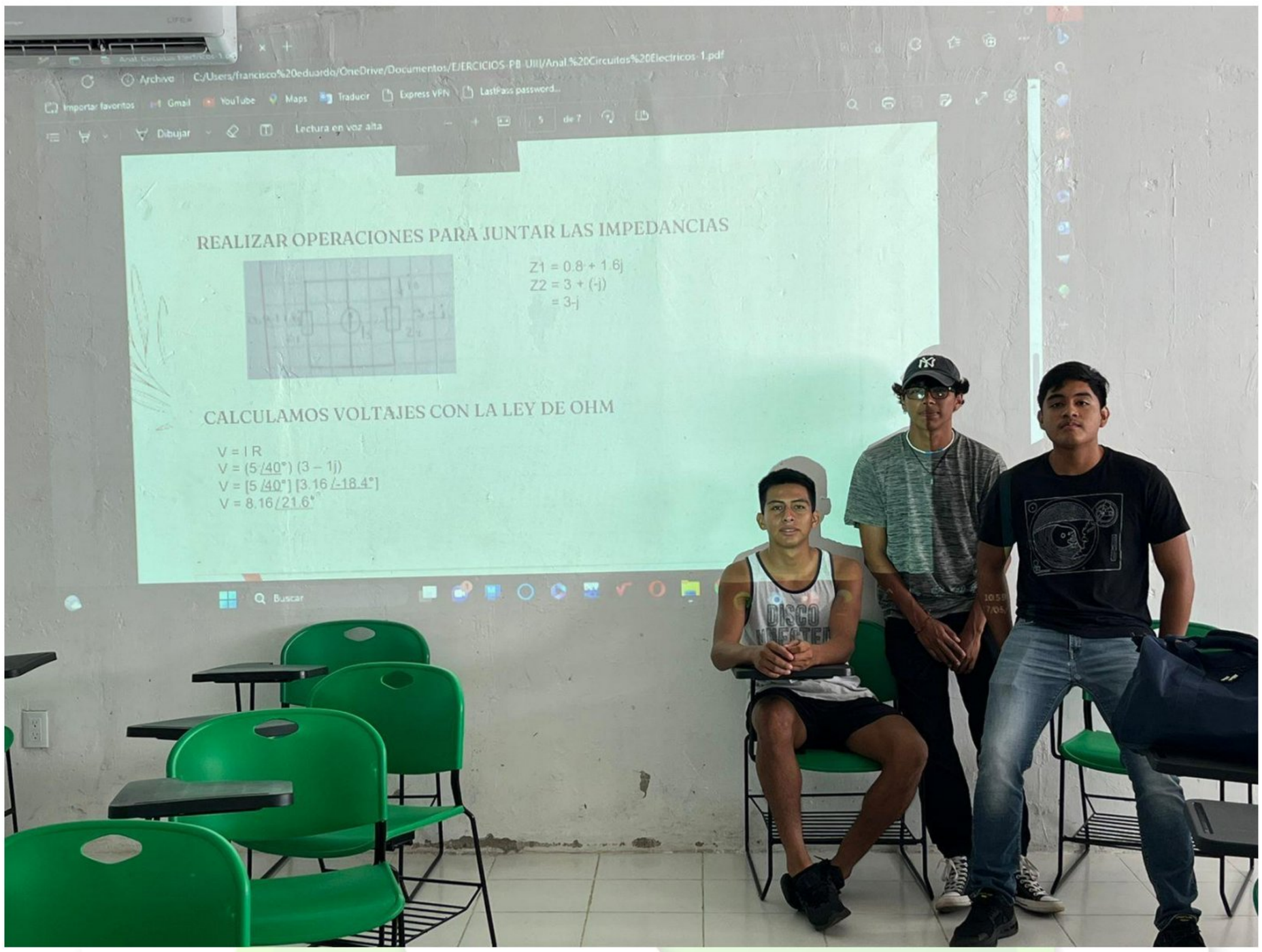
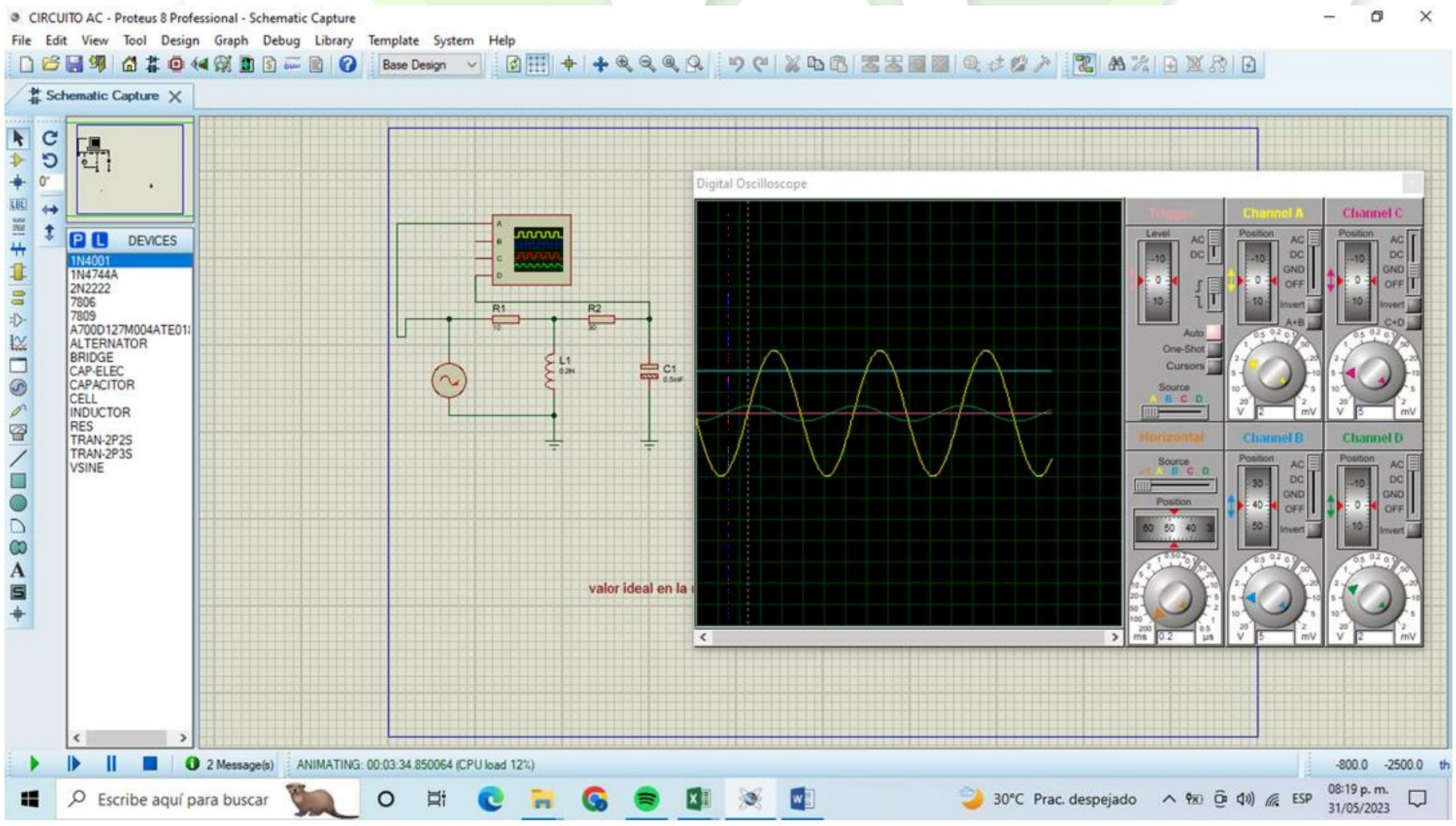


Figura 9.53 Para el problema 9.46.



Actividades: Simulación de circuitos RLC con corriente alterna



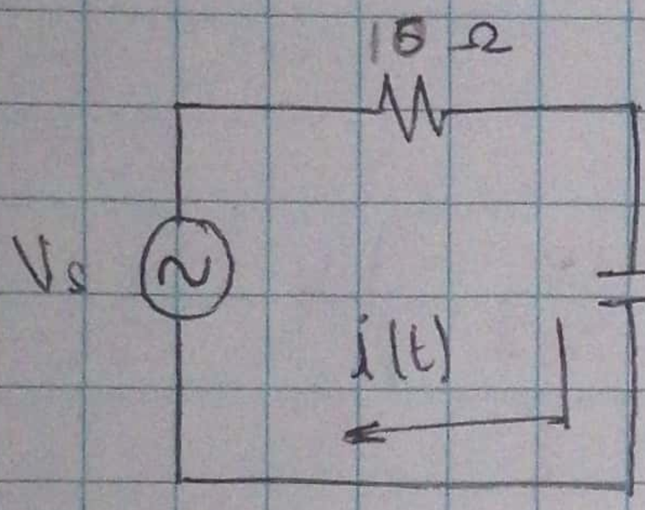
Unidad 3 03/05/23

Técnica de análisis de circuitos de CA

3.3 Análisis de circuitos RLC

Ejemplo

Para el circuito dado encuentre $v(t)$ e $i(t)$



Realizar un cambio Dominio

$10 \angle 0°$

$V_s(t) = 10 \cos 1t \quad \omega = 1$

$R = 10\,\Omega \qquad Z = 10\,\Omega$

$C = 0.1\,F \qquad Z_C = \frac{1}{j\omega C}$

$V_s = 10 \cos 1t$

$R = 10\,\Omega$

$C = 0.1\,F$

Z = impedancia

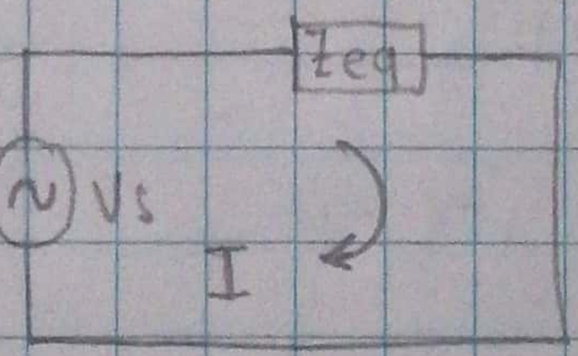
$$Z_C = \frac{1}{j(1)(0.1)} = \frac{1}{j0.1} = \frac{1}{0.1j} = -\frac{1}{0.1}j$$

$$Z_C = -2.5j$$

$$Z_{eq} = Z_R + Z_C$$

$$= 10\,\Omega + \frac{1}{0.1j}$$

$$= 10 - 2.5j$$



Calculo $i(t)$

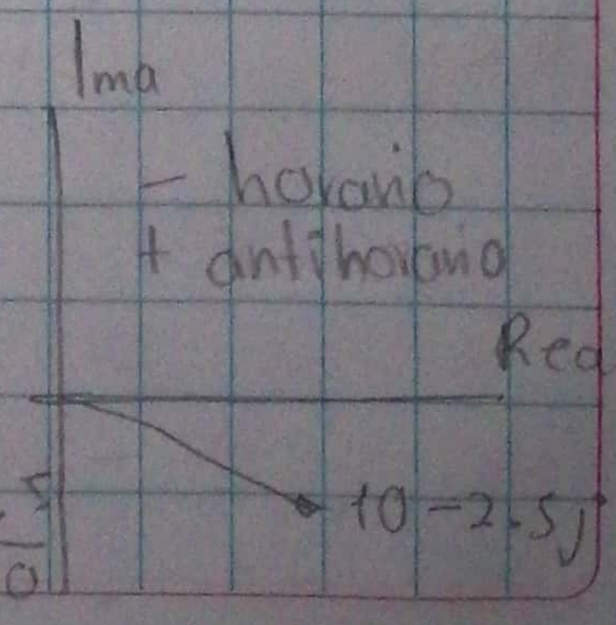
$V = IZ$

$I = \frac{V}{Z_{eq}}$

$I = \frac{10 \angle 0°}{10 - 2.5j}$ → Polar

→ Rectangular

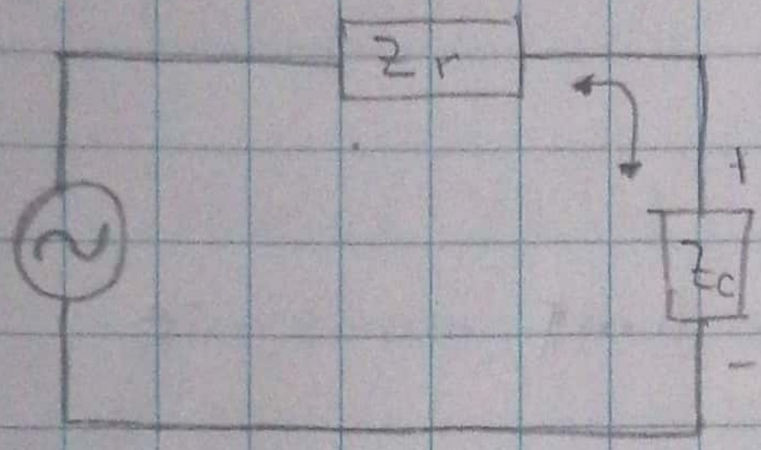
$I = \frac{10 \angle 0°}{10.30 \angle -14°}$



$\theta = \tan^{-1}\left(\frac{2.5}{10}\right)$

$I = 0.97 \angle 14°$ Fasorial

$i(t) = 0.97 \cos(4t + 14°)$



Vala de la corriente es la misma

$\therefore$ El voltaje es igual a la ley de ohm

$V(t) = (0.97 \cos(4t + 14°)) \cdot (-2.5\,j)$

$V_c = I\, Z_c$

$= [0.97 \angle 14°][-2,5\,j]$ Rec.

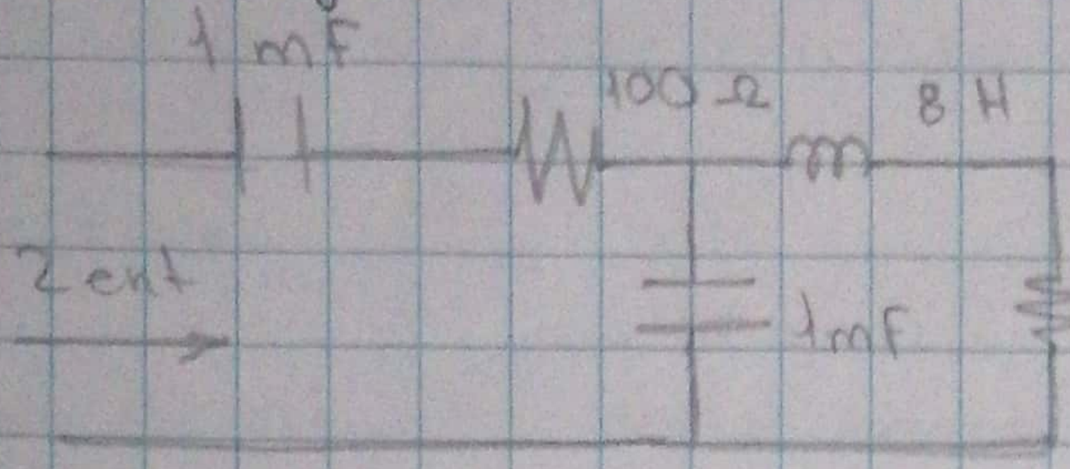
Pol.

$= [0.97 \angle 14°][-2.5 \angle -90°]$

$V_c = 2.42 \angle -76°$

$V_c(t) = 2.42 \cos(4t - 76°)$

Determine la impedancia de entrada del circuito de la figura 9.29 en $\omega = 10$ rad/s.



Z_1 = Impedancia del capacitor de 1 mF en serie con el resistor de 100 Ω

Z_2 = Impedancia del capacitor de 1 mF

Z_3 = Impedancia del inductor de 8 H en serie con el resistor de 200 Ω

$$Z_1 = \frac{1}{j\omega C} + 100\,\Omega = 100 + \frac{1}{j(10)\,1\times10^{-3}} = (100 - j100)\,\Omega$$

$$Z_2 = \frac{1}{j\omega C} = \frac{1}{j(10)\,1\times10^{-3}} = -j100\,\Omega$$

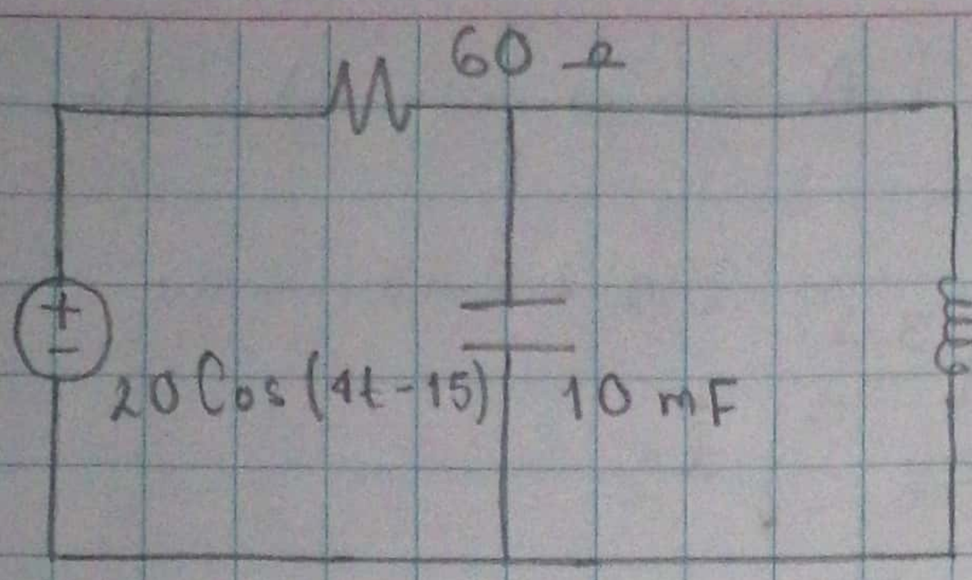
$$Z_3 = 200 + j\omega L = 200 + j(10) \times 8 = (200 + j80)\,\Omega$$

La Impedancia de entrada es:

$$Z_{en} = Z_1 + Z_2 /\!/ Z_3 = (100 - j100)\,\Omega + \frac{(-j100\,\Omega)(200 + j80)\,\Omega}{200 - j20}$$

$$= (100 - j100)\,\Omega + \frac{200 - j \quad |200 - j20|}{200^2 - 20^2}$$

10/05/23



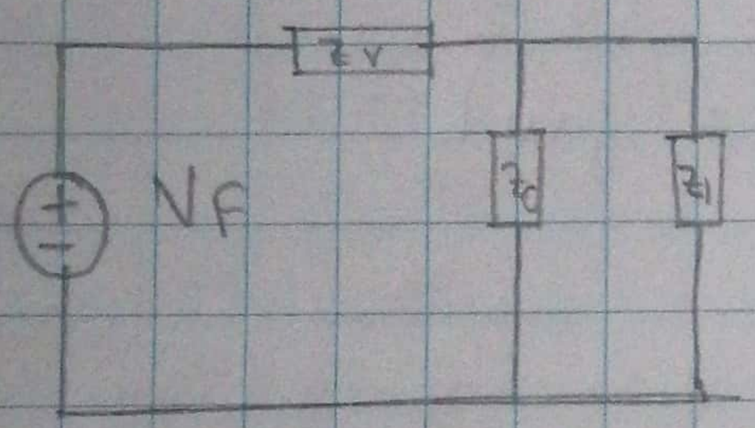
$\omega = 4$

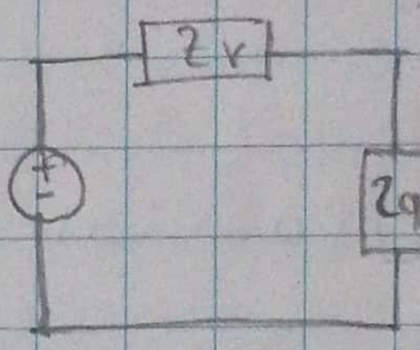
$V_F = 20 \angle -15°$

Calcular $V_o(t)$

$$Z_c = -\frac{j}{\omega C} = -\frac{j}{(4)(10\times10^{-3})} = -25j$$

$$Z_L = j\omega L = 20j$$

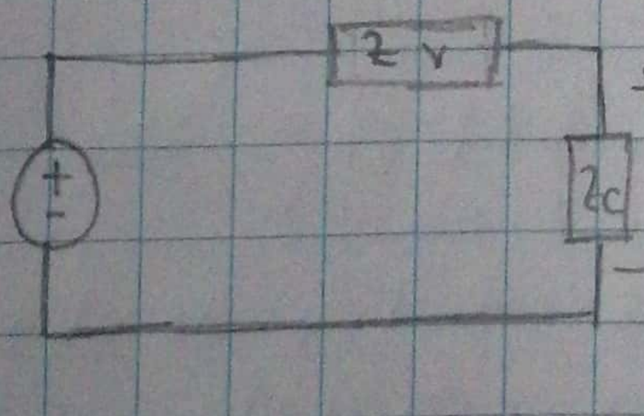




$$Z_{eq} = Z_c // Z_L = \frac{Z_c Z_L}{Z_c + Z_L}$$

$$= \frac{(-25j)(20j)}{-25j + 20j} = \frac{+500}{-5j} = 100j$$

$$j^2 = \sqrt{-1}$$



Por divisor de voltaje

$$V_o = \left[\frac{Z_{eq}}{Z_v + Z_{eq}}\right] V_F = \left[\frac{100j}{60 + 100j}\right] 20\angle -15°$$

$$V_o = \left[\frac{(100\angle 90°)}{(116\angle 59°)}\right] 20\angle -15°$$

$$= \left[\frac{2000\angle 75°}{116\angle 59°}\right] = 1.72\angle 16°$$

Se resta al dividirlo

$$V_o = 17.2\angle 16°$$

$$V_o(t) = 17.2\cos(4t + 16°)$$

↑ divide

16/05/23

9.46 Si $i_s = 5\cos(10t + 10°)$ A en el circuito de la figura 9.53, halle i_o.

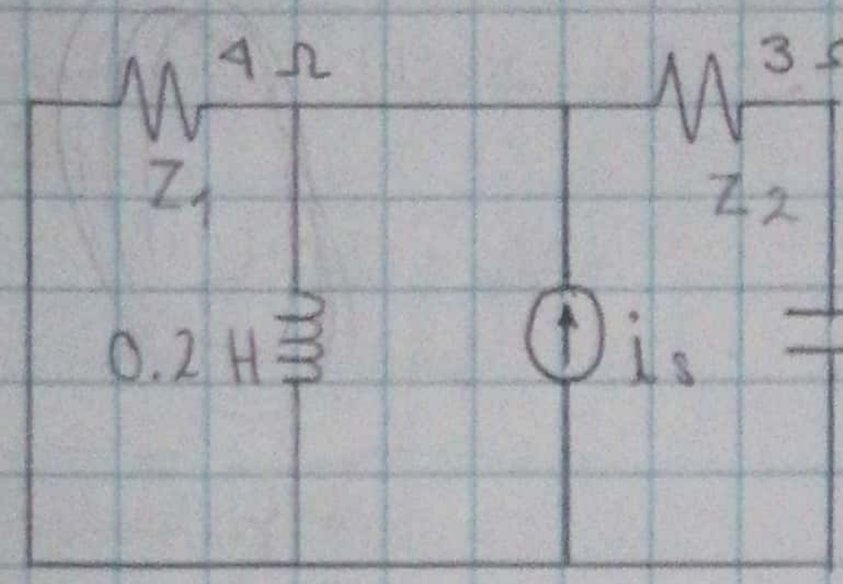


Fig. 9.53

$i_s = 5\cos(10t + 10°)$

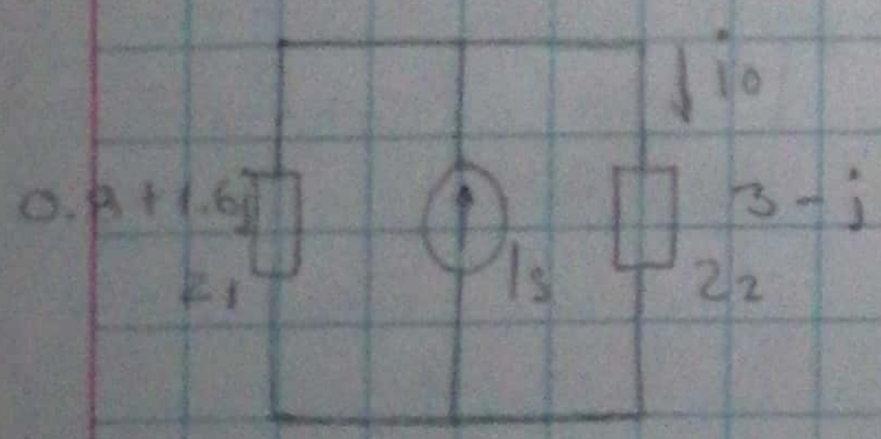
$\omega = 10$

Realizar cambio fasorial

$\dot{I}_s = 5\angle 10°$

$Z_c = \frac{1}{j(10)(0.1)} = \frac{1}{j1} = -j$

$Z_L = j(10)(0.2) = 2j$



$Z_{eq} = \frac{(4)(2j)}{4+2j} + \frac{8j}{4+2j}$

Realizar operaciones para juntar las impedancias

$Z_1 = 0.8 + 1.6j$

$Z_2 = 3 + (-j) = 3 - j$

Calculamos voltajes con ley de ohm ya que voltajes en paralelo es lo mismo.

$V = IR$

$V = (5\angle 40°)(3 - 1j)$

$= [5\angle 40°][3.16\angle -18.4°$

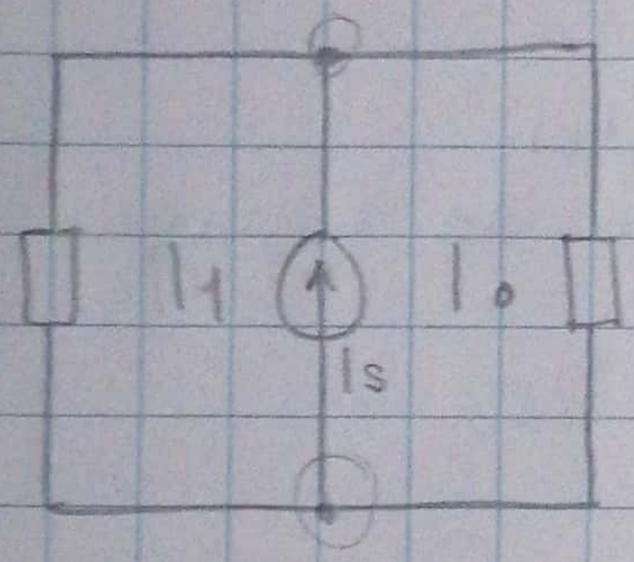
$= 8.16\angle 21.6$

$$\frac{8j}{4+2j} \cdot \frac{4-2j}{4-2j} = \frac{32j - 16j^2}{16 - 4j^2} = \frac{32j + 16}{16+4} = \frac{16+32j}{20}$$

$$\frac{4(4+8j)}{4\,|\,5|}$$

$I = \frac{V}{R}$ $\quad I = \frac{8.16 \angle 21.6^\circ}{1.788 \angle 63.1^\circ}$ → Convertimos a polar

$= 4.56 \angle -41.8^\circ$



Obtenemos i cero

$I_1 = 4.56 \angle -41.8^\circ$

$I_S = 5 \angle 40^\circ$

$I_S = I_1 + I_0$

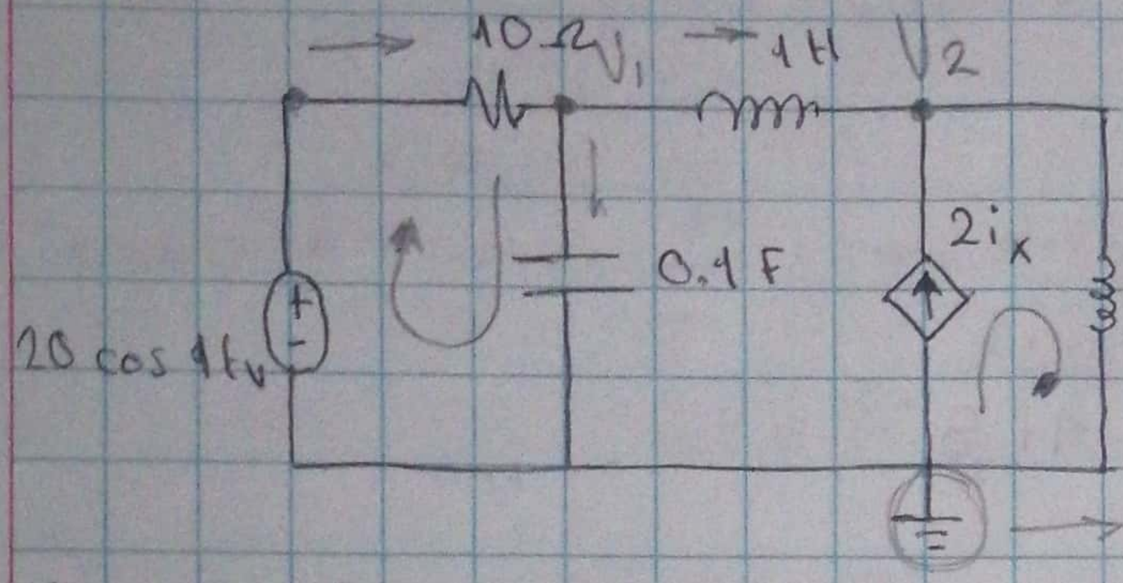
$I_0 = I_1 - I_S$

$I_0 = 4.56 \angle -41.8^\circ - (5 \angle 40^\circ)$

$I_0 = -0.44 \angle -81.8^\circ$

21/05/23

Analisis Nodal



V_1 = Voltaje del nodo

1. Definir nodos
2. Definir sentido de las corrientes
3. Convertir el circuito al dominio de frecuencia

$20\cos 4t = 20\angle 0°$ $\quad \omega = 4$ rad/s

$1H = j\omega L = j4$

$0.5H = j\omega L = j2$

$0.1F = \frac{1}{j\omega C} = -j2.5$

4. Aplicar LCK en los nodos
Corrientes que llegan es igual a las que salen

$I_1 = I_x + I_2$ $\quad I_1 \rightarrow$ Nodo $\rightarrow I_2$, $\downarrow I_x$

$\frac{20 - V_1}{10} = \frac{V_1 - 0}{-j2.5} + \frac{V_1 - V_2}{j4}$ $\quad$ (0 → tierra)

$(1 + j1.5)V_1 + j2.5V_2 = 20$

5. Aplicar ley de ohm para

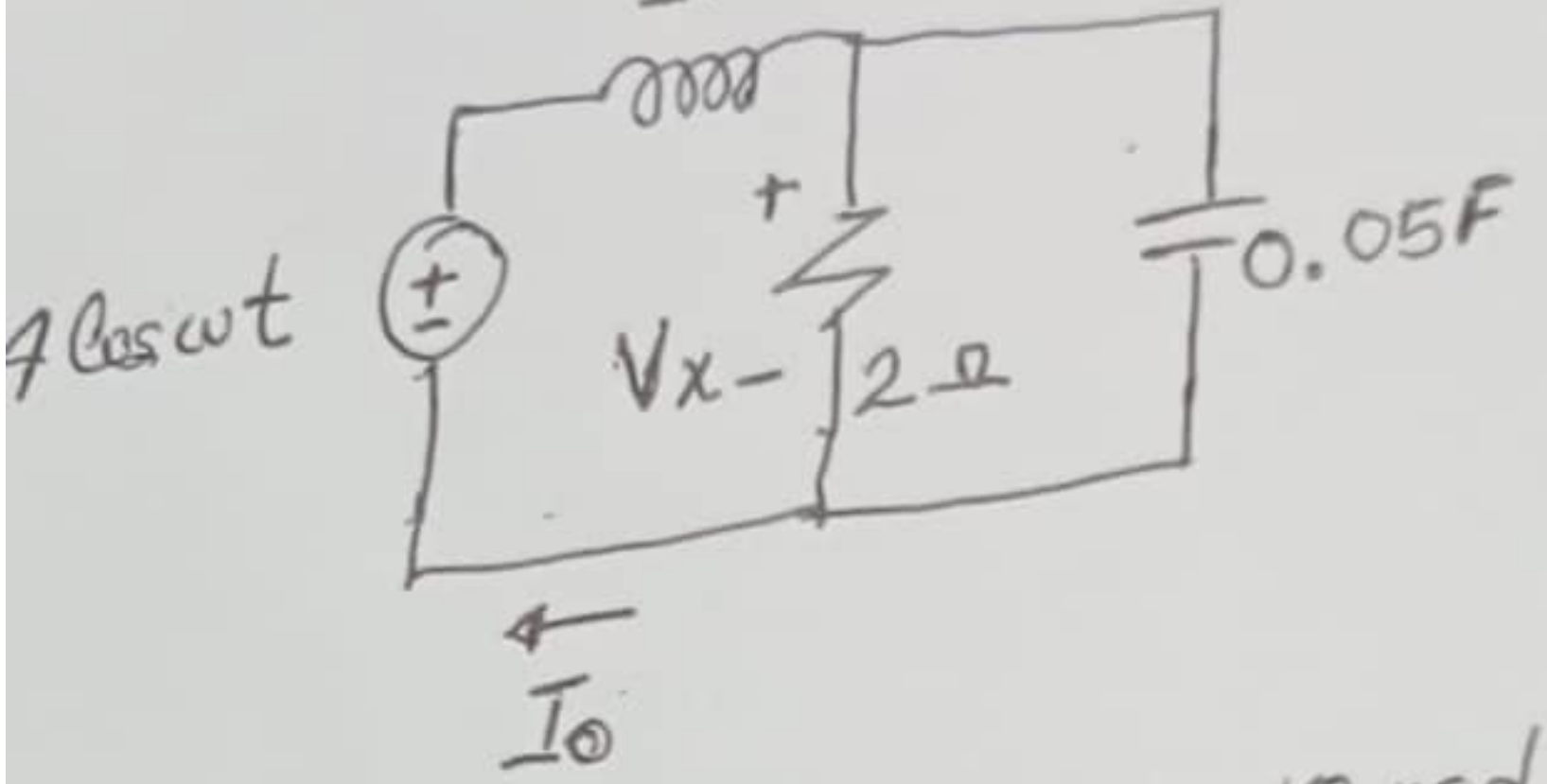
$\frac{20 - V_1}{10} = I_1$ $\quad i = \frac{V}{2}$ $\quad \frac{20}{10} - \frac{V_1}{10} = 25jV_1 + \frac{V_1}{4j} - \frac{V_2}{4j}$

Pag. 379 del libro

EXAMEN UNIDAD III

Problema UNICO ANALISIS DE CIRCUITOS ELÉCTRICO

Para el circuito dado determine I_o, V_x y Z_{TOTAL}



$\omega = 10$ rad/s

$\omega = 5$ rad/s

$\omega = 4$ rad/s

A - F

G - L

M - Z

CLARIDAD ORDEN Y

EN EL DESARROLL

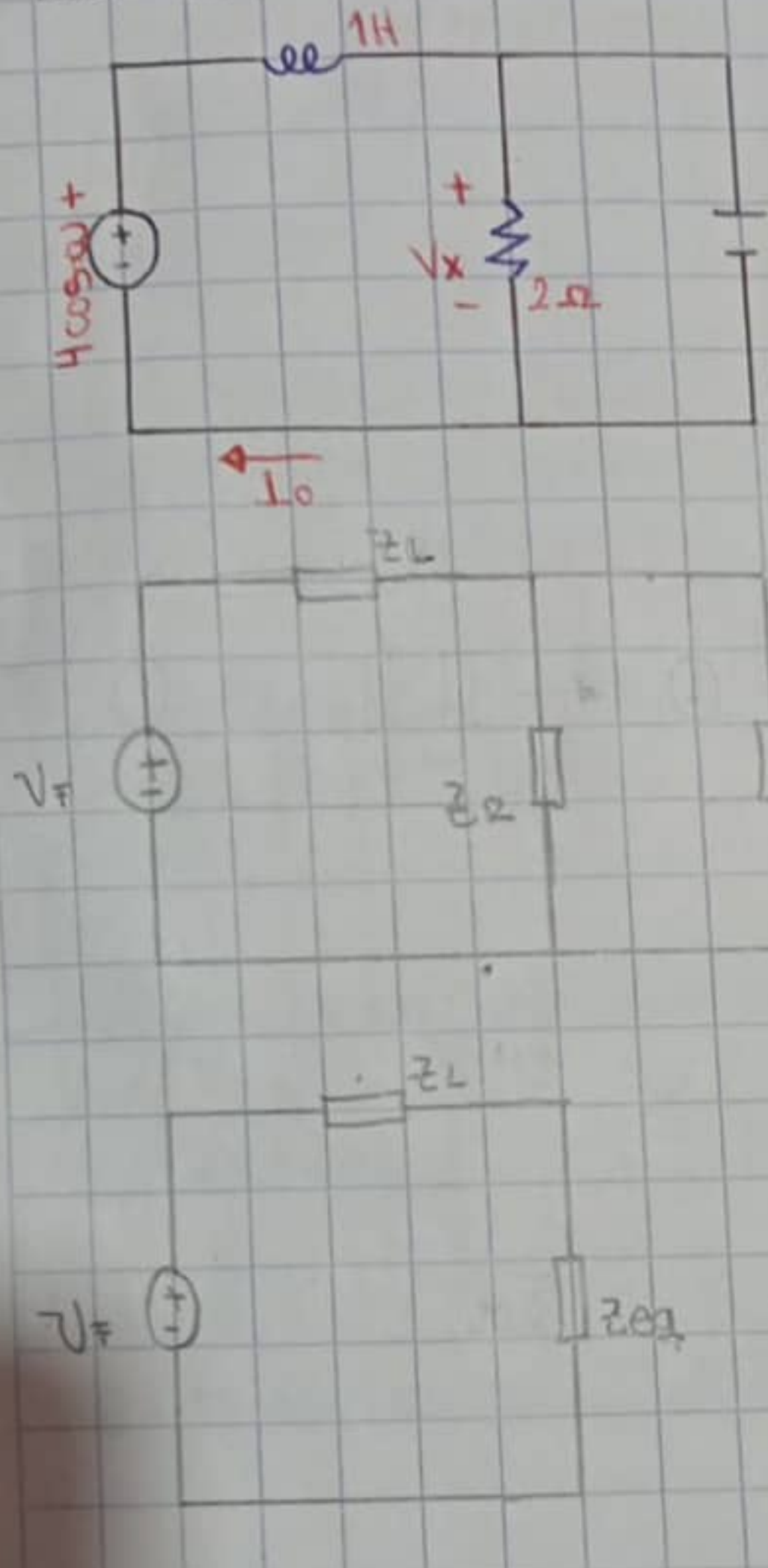
12

M-2 → ω = 4 rad/s

EXAMEN 411 - B UNIDAD III

PROBLEMA UNICO

Para el circuito determine I_o, V_x y t total



$Z_R = 2\Omega$

$Z_C = -5j$

$Z_L = 4j$

$V_F = 4\angle 0°$

$Z_{eq} = 1.704 - 0.689j$

$= 1.85\angle -21.78°$

$Z_T = 1.704 + 3.31j = 3.73$

$V_o = 0.48\angle 11.3°$

$I_o = 1.07\angle 62.48$

David Uziel Perez Del Angel 82
Jose Luis Patiño Barrios 82
Zaira Itzel Morales Azamar 82
Raul Marcial Arres 82
Marlene Martinez Cosme 82

divisor de voltaje