Tarea Semanal 1
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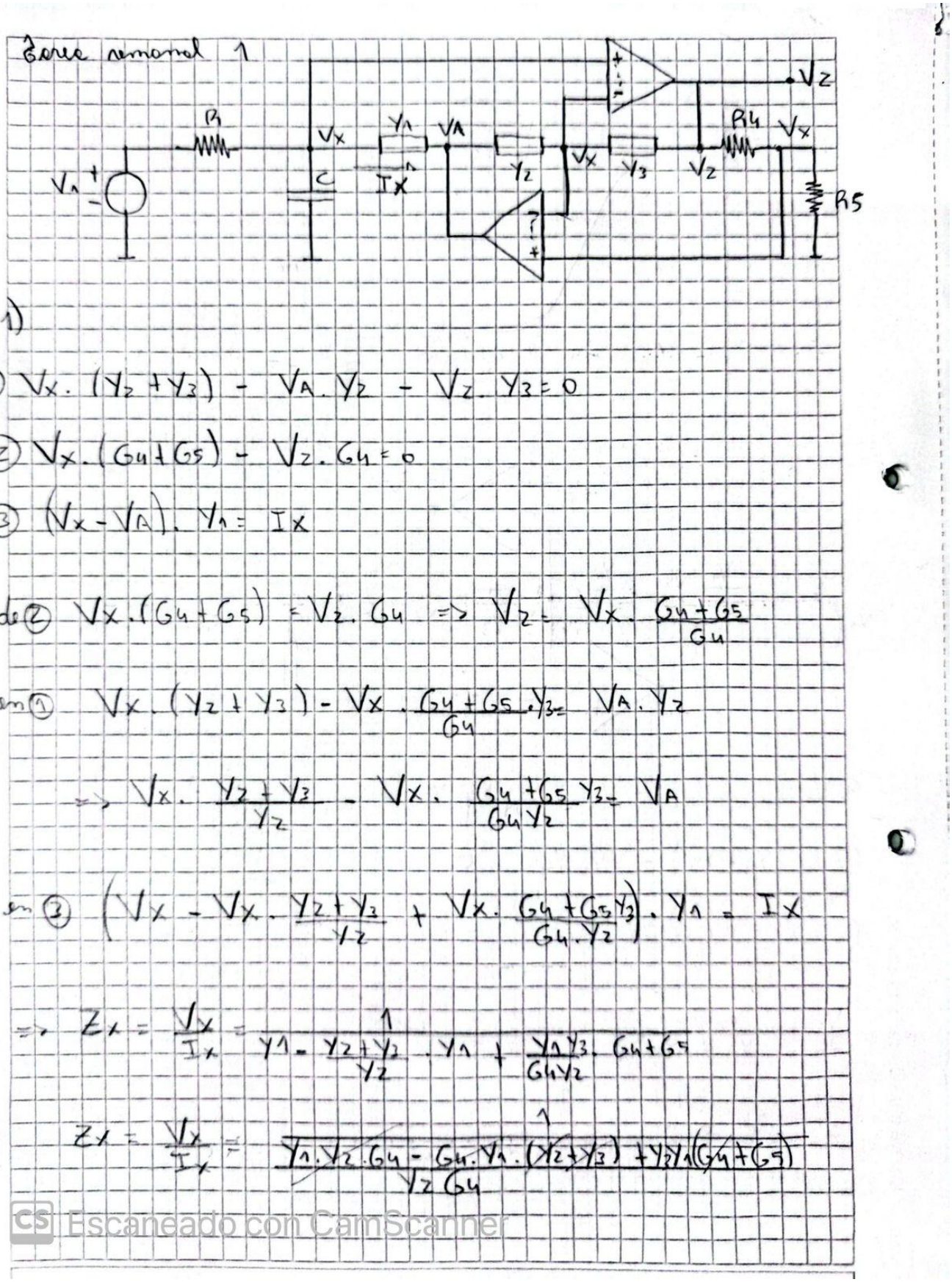
Resolución:



1)

① $V_x \cdot (Y_2 + Y_3) - V_A \cdot Y_2 - V_z \cdot Y_3 = 0$

② $V_x \cdot (G_4 + G_5) - V_z \cdot G_4 = 0$

③ $(V_x - V_A) \cdot Y_1 = I_x$

de ② $V_x \cdot (G_4 + G_5) = V_z \cdot G_4 \Rightarrow V_z = V_x \cdot \frac{G_4 + G_5}{G_4}$

en ① $V_x \cdot (Y_2 + Y_3) - V_x \cdot \frac{G_4 + G_5}{G_4} \cdot Y_3 = V_A \cdot Y_2$

$\Rightarrow V_x \cdot \frac{Y_2 + Y_3}{Y_2} - V_x \cdot \frac{G_4 + G_5}{G_4 Y_2} Y_3 = V_A$

en ③ $\left(V_x - V_x \cdot \frac{Y_2 + Y_3}{Y_2} + V_x \cdot \frac{G_4 + G_5}{G_4 \cdot Y_2} Y_3\right) \cdot Y_1 = I_x$

$\Rightarrow Z_1 = \frac{V_x}{I_x} = \frac{1}{Y_1 - \frac{Y_2 + Y_3}{Y_2} \cdot Y_1 + \frac{Y_1 Y_3}{G_4 Y_2} \cdot G_4 + G_5}$

$Z_1 = \frac{V_x}{I_x} = \frac{Y_2 G_4}{Y_1 \cdot Y_2 \cdot G_4 - G_4 \cdot Y_1 \cdot (Y_2 + Y_3) + Y_3 Y_1 (G_4 + G_5)}$

$$Z_x = \frac{V_x}{I_x} = \frac{Y_2 G_4}{Y_1 Y_3 G_5}$$

$Z_1 = \frac{1}{Y_1} = R_1 = R_5 = 1$; $R_4 = 1$

$Z_3 = \frac{1}{Y_3} = R_3 = R_5 = 1$; $Z_2 = \frac{1}{Y_2} = \frac{1}{SC_2}$, $C_2 = 1$

$Z_x = SC_2 \cdot \frac{R_1 R_3 R_5}{R_2} = S\,Le_4$; $Le_4 = 1$

2)

① $V_x \cdot \left(SC_2 + \frac{1}{R_3}\right) - V_A \cdot SC_2 - V_2 \cdot \frac{1}{R_3} = 0$

② $V_x \cdot \left(\frac{1}{R_4} + \frac{1}{R_5}\right) - V_2 \cdot \frac{1}{R_4} = 0$

③ $V_x \cdot \left(\frac{1}{R} + SC + \frac{1}{R_1}\right) - V_1 \cdot \frac{1}{R} - V_A \cdot \frac{1}{R_1} = 0$

de ② $\Rightarrow$ $V_x = \frac{\frac{V_2}{R_4}}{\frac{R_5 + R_4}{R_4 \cdot R_5}} \Rightarrow V_x = V_2 \cdot \frac{R_5}{R_4 + R_5}$

en ③ $V_2 \cdot \frac{R_5}{R_4 + R_5} \cdot \frac{R_1 + SCR R_1 + R}{R \cdot R_1} - \frac{V_1}{R} R_1 = \frac{V_A}{R_1}$

$\Rightarrow V_A = V_2 \cdot \frac{R_5 \cdot (R_1 + SCR R_1 + R)}{R \cdot (R_4 + R_5)} - V_1 \cdot \frac{R_1}{R}$

en ①

$$V_2 \cdot \frac{R5}{R4+R5} \cdot \left(\frac{SC_2R3+1}{R3}\right) - V_2 \cdot \frac{R5 \cdot (R1+SCRR1+R)}{R \cdot (R4+R5)} \cdot SC_2 +$$

$$+ V_1 \frac{SC_2R1}{R} - \frac{V_2}{R3} = 0$$

$$V_1 \cdot \frac{SC_2R1}{R} = V_2 \cdot \left[\frac{1}{R3} + \frac{SC_2R5 \cdot (R1+SCRR1+R)}{R \cdot (R4+R5)} - \frac{R5 \cdot (SC_2R3+1)}{R3 \cdot (R4+R5)}\right]$$

$$V_1 \cdot \frac{SC_2R1}{R} = V_2 \cdot \left[\frac{R \cdot (R4+R5) + SC_2R5R3(R1+SCRR1+R) - RR5(SC_2R3+1)}{R3R \cdot (R4+R5)}\right]$$

$$\frac{V_2}{V_1} = \frac{SC_2R1 \cdot R3 \cdot R \cdot (R4+R5)}{R^2 \cdot R4 + R^2 \cdot R5 + SC_2R5R1RR3 + S^2C_2R5CR^2R1R3 + SC_2R5R3^2 - R^2R5SC_2R3 - R^2R5}$$

$$\cdot \frac{1}{}$$

$$\frac{V_2}{V_1} = \frac{SC_2R1R3 \cdot R \cdot (R4+R5)}{S^2C_2CR^2R1R3R5 + SC_2RR1R3R5 + R^2 \cdot R4}$$

$$\frac{V_2}{V_1} = \frac{S \cdot \frac{(R4+R5)}{CR1R5}}{S^2 + S\frac{1}{CR} + \frac{R4}{C_2CR1R3R5}}$$

$$\frac{V_2}{V_1} = \frac{S \cdot \frac{1}{CR} \cdot \left(\frac{R4}{R5}+1\right)}{S^2 + S\frac{1}{CR} + \frac{R4}{C_2CR1R3R5}}$$

$w_o = 2\pi \cdot f_o = 20\pi\,k\,\frac{rad}{s}$ $\quad Q = 20$ $\quad K = 10$

$C_2 = C = 1$ $\quad R_5 = 1 = R_3$ $\quad R_4, R_1, R$

$w_o^2 = \frac{R_4}{R_1}$

$R_4 = w_o^2 \cdot R_1$

$K = R_4 + 1 = 10 \Rightarrow R_4 = 9$

$\frac{w_o}{Q} = \frac{1}{Q} = \frac{1}{R} \Rightarrow R = 20$

C' / 1nF, 100nF

$C' = 10nF = \frac{1}{\Omega w \cdot \Omega z} \Rightarrow \Omega z = \frac{1}{\Omega w \cdot 10nF}$

$\Omega z = 1591\,\Omega$

$\Omega w = 2\pi f_o = w_o = 20\pi k\,\frac{rad}{s}$