

PREINFORME SESIÓN 4.

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a)

Calculamos la tensión en el nodo A de la componente continua del circuito:

The handwritten work shows a circuit diagram on the left with a 10V DC source V_1 , a 2.2k Ω resistor R_1 , a 100nF capacitor C , an AC source V_2 , and a 1k Ω resistor R_2 . An arrow labeled "Tratando con corriente continua" points to a simplified DC circuit on the right, where the capacitor is an open circuit and the AC source is replaced by a short circuit. The simplified circuit has V_1 in series with R_1 and R_2 . Node A is the junction between R_1 and R_2 .

$$I = \frac{V_1}{R_{eq}} = \frac{V_1}{R_1 + R_2} = \frac{10}{3200} = 3.125 \cdot 10^{-3}$$
$$V_1 = V_{R_1} + V_{R_2} \Rightarrow V_{R_2} = V_1 - V_{R_1}$$
$$V_{R_1} = I \cdot R_1 = 3.125 \cdot 10^{-3} \cdot 2200 = 6.875V$$
$$V_{R_2} = V_1 - V_{R_1} = 10 - 6.875 = 3.125V = V(A)$$

La tensión calculada teóricamente coincide con la obtenida en la simulación:

The screenshot shows a circuit simulation window with a circuit diagram on the left and a "Operating Point" results window on the right. The circuit diagram includes a 10V DC source V_1 , a 2.2k Ω resistor R_1 , a 100nF capacitor C_1 , an AC source V_2 (set to AC 2 0), and a 1k Ω resistor R_2 . Node A is marked at the junction of R_1 and R_2 .

The "Operating Point" window displays the following results:

Variable	Value	Unit	Type
$V(n001)$	10	voltage	DC
$V(a)$	3.125	voltage	DC
$V(n002)$	0	voltage	DC
$I(C1)$	3.125e-019	device_current	DC
$I(R2)$	0.003125	device_current	DC
$I(R1)$	-0.003125	device_current	DC
$I(V2)$	3.125e-019	device_current	DC
$I(V1)$	-0.003125	device_current	DC

b)

Calculamos las ganancias en decibelios teóricamente:

Finalmente, calculamos las fases de la ganancia para las frecuencias de prueba:

$$\theta(x) = -\arctg(-1/(2\pi RCf))$$

$$\theta(10\text{Hz}) = 89.75^\circ$$

$$\theta(100\text{Hz}) = 87.52^\circ$$

$$\theta(500\text{Hz}) = 77.81^\circ$$

$$\theta(1000\text{Hz}) = 66.64^\circ$$

$$\theta(5000\text{Hz}) = 24.84^\circ$$

The image contains handwritten notes and circuit diagrams on a piece of paper. At the top left, there is a circuit diagram of an RC network. It consists of a voltage source V_1 (10V), a resistor R_1 (2.2kΩ), a capacitor C_1 (100nF), and a resistor R_2 (1kΩ). The output voltage V_2 is measured across R_2 . To the right of this diagram, there is a note: "TENIENDO EN CUENTA SOLO LA CORRIENTE ALTERNIA" (Taking into account only the alternating current). Below this, there is a simplified circuit diagram showing an AC voltage source V_2 in series with a capacitor C_1 (100nF) and a parallel combination of resistors $R_1 || R_2$ (687.5Ω). The output terminals are labeled A and B.

Below the diagrams, the text reads: "Siguiendo la fórmula de ganancia de tensión:" (Following the voltage gain formula:). The formula for the voltage gain $A_v(jf)$ is derived as follows:

$$A_v(jf) = \frac{V_o}{V_i} = \frac{iR}{i(z_c + R)} = \frac{1}{1 + R^{-1}z_c} = \frac{1}{1 + \frac{1}{j2\pi RCf}}$$

Next, the text says: "Tomamos 6 valores de prueba" (We take 6 test values). A table of calculated voltage gains $|A_v|$ is shown for frequencies from 10 Hz to 10,000 Hz. To the right of this table, the gains are converted to decibels (dB) using the formula $dB = 20 \cdot \log(|A_v|)$.

Frecuencia (Hz)	Ganancia $ A_v $	Ganancia (dB)
10	$4.13 \cdot 10^{-3}$	-47.33 dB
100	$4.13 \cdot 10^{-2}$	-27.33 dB
500	$2.11 \cdot 10^{-1}$	-13.55 dB
1000	$4 \cdot 10^{-1}$	-7.96 dB
5000	$9.4 \cdot 10^{-1}$	-0.92 dB
10000	$9.7 \cdot 10^{-1}$	-0.26 dB

The final note at the bottom right of the page says: "EXPRESADO EN dB" (Expressed in dB).

Finalmente, calculamos las fases de la ganancia para las frecuencias de prueba:

$$\theta(x) = -\arctg(-1/(2\pi RCf))$$

$$\theta(10\text{Hz}) = 89.75^\circ$$

$$\theta(100\text{Hz}) = 87.52^\circ$$

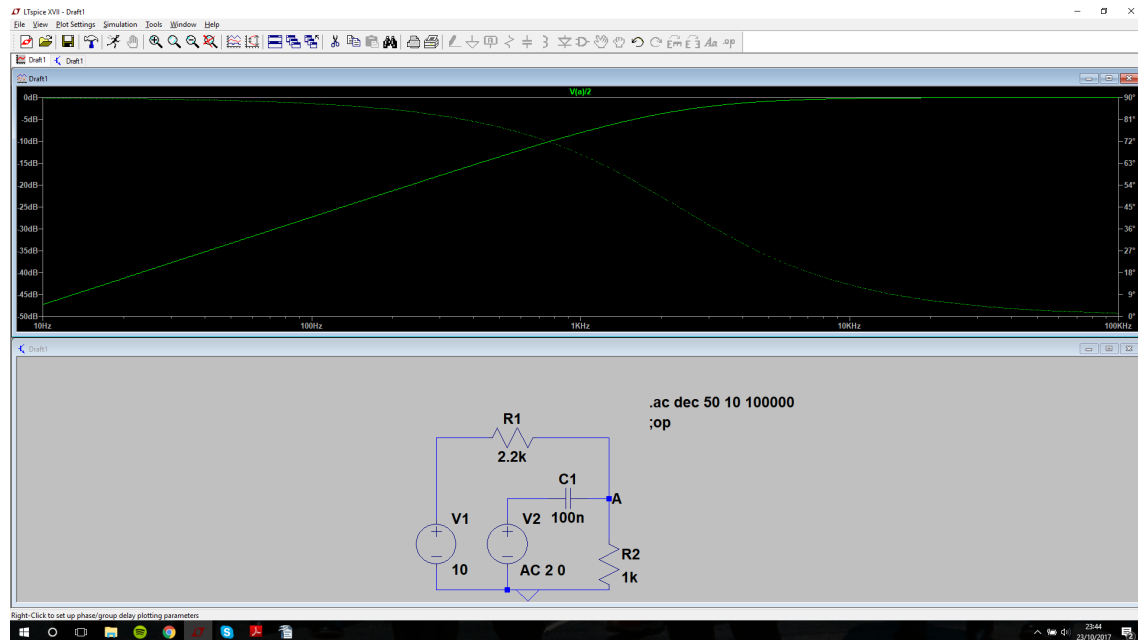
$$\theta(500\text{Hz}) = 77.81^\circ$$

$$\theta(1000\text{Hz}) = 66.64^\circ$$

$$\theta(5000\text{Hz}) = 24.84^\circ$$

$$\theta(10000\text{Hz}) = 13.03^\circ$$

Realizamos el barrido de frecuencias y en la gráfica se observa que los resultados coinciden con los teóricos:



Deducimos que el comportamiento del circuito se asemeja al de un filtro pasivo de paso alto.