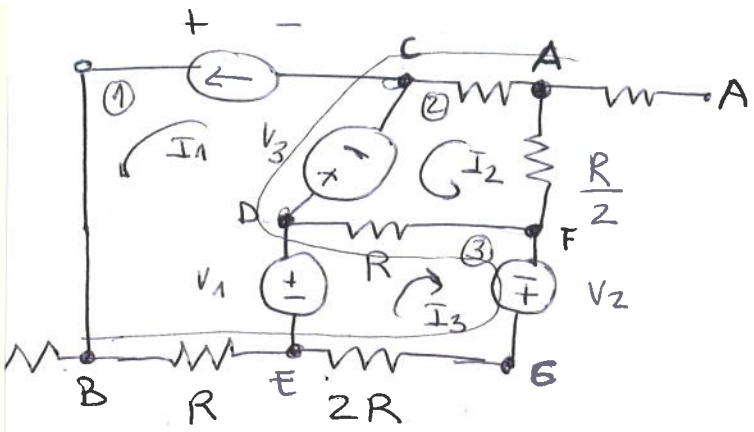
18:26

(1)

ADVERTENCIAS

-) DIBUJAR EL CAMINO SOMBREADO [P4]
-) CAMBIAR [P5.b]

$v_1(t) = 6 \cdot \sin(\omega t)$



$+V_1 + \mathcal{E}_I - V_3 = R I_1 \Rightarrow \mathcal{E}_I = R \cdot I_1 + V_3 - V_1 = 1V + 6V - 2V = 5V = \mathcal{E}_I$

Malla 2

$V_3 = \left(R + R + \frac{R}{2}\right) I_2 + R I_3 = \frac{5R}{2} I_2 + R I_3 = 6V$

$$\frac{5}{2} I_2 + I_3 = 6mA$$

Malla 3

$V_1 + V_2 = 3R I_3 + R I_2 = 6V \Rightarrow 6mA = I_2 + 3 I_3$

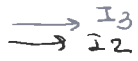
$$I_2 = 1'85\ mA$$
$$I_3 = 1'38\ mA$$

0'4

Vth

$V_A - V_C = R I_2 = 1'85V$

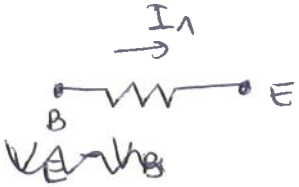
$V_D - V_C = 6V$



$V_D - V_F = R(I_2 + I_3) = 3'23V$

$V_G - V_F = 4V$

$V_G - V_E = R I_3 = 1'38$



$V_B - V_E = R I_1 = 1V$

$V_A - V_C = 1'85\,V$

$V_C - V_D = -6\,V$

$V_D - V_F = 3'23\,V$

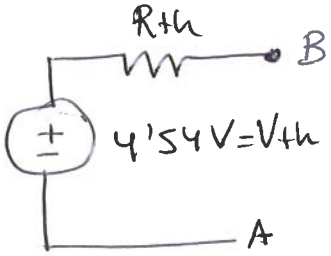
$V_F - V_G = -4\,V$

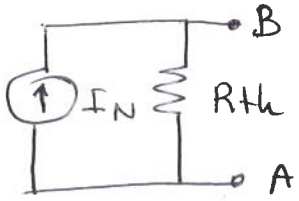
$V_G - V_E = 1'38\,V$. 2

$V_E - V_B = -1\,V$

$V_A < V_B$

$V_{th} = 4'54\,V$ 0'4

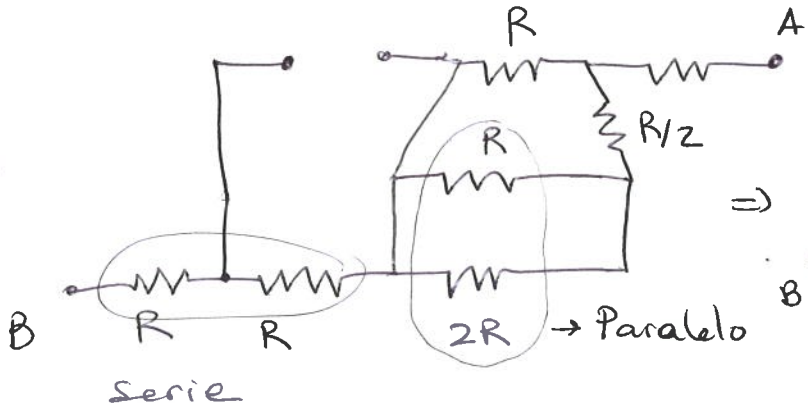


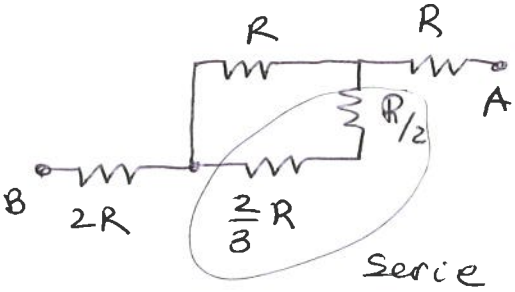


0'2

$V_A - V_B = -3'46\,V$

Rth

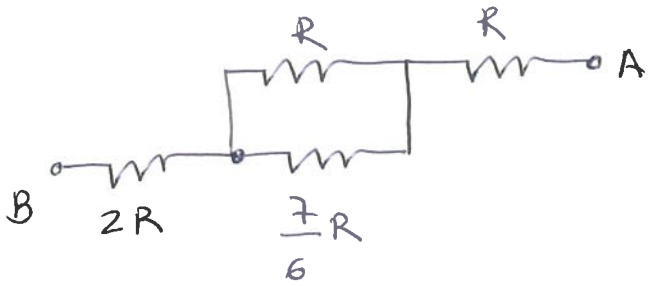


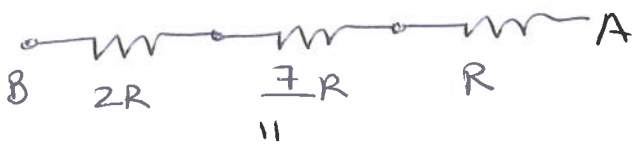


$$\frac{2R \cdot R}{2R+R} = \frac{2}{3}R$$

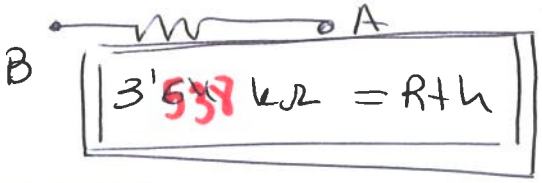
$$\frac{2}{3}R + \frac{R}{2} = R \cdot \left(\frac{4+3}{6}\right) = \frac{7}{6}R$$

0'4





$$\frac{\frac{7}{6}R^2}{\frac{7}{6}R+R} = \frac{7}{11}R$$



$I_N = 1'25\,mA$ 0'1

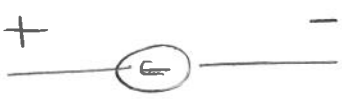
b) El e^- iría donde hay más potencial x q

$\vec{E}$ va en el sentido de los potenciales decrecientes y $\vec{F} = q\vec{E} = -e\vec{E}$, la $\vec{F}$ va en contra de $\vec{E}$ x q la carga del e^- es < 0.

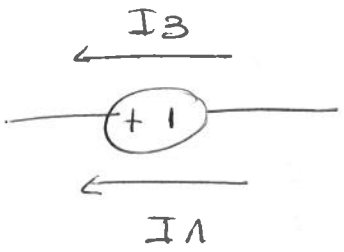
Por tanto, e^- va hacia B.

c) $P = \Delta V \cdot I$

I_1 $P = \varepsilon_I \cdot I_1 = 5V \cdot 1mA = 5mW \rightarrow$ Suministrada



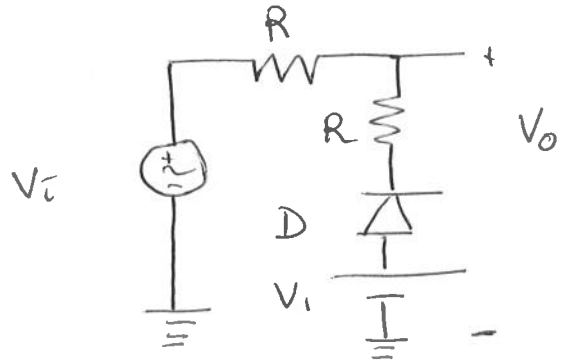
V_1 $P = V_1 \cdot (I_1 + I_3) = 2V\,(1mA + 1'38m) = 4'76\,mW$



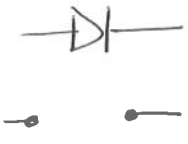
Suministrada.

EJERCICIO 5

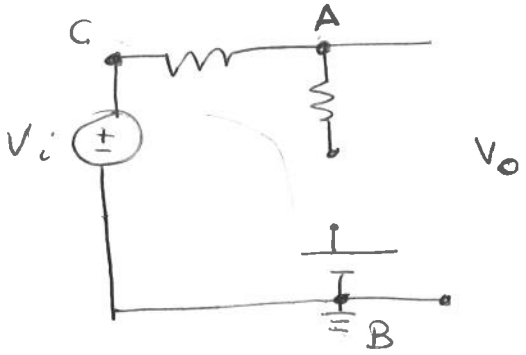
a)



DIODO OFF



$\Rightarrow$



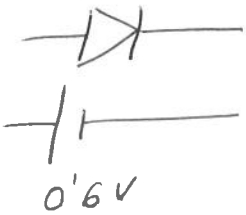
Como hay un circuito abierto, no circula corriente, por tanto, $I = 0$. $V_o = V_A - V_B$

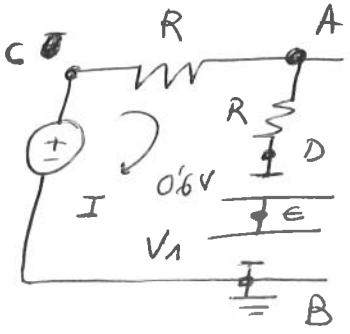
$V_C - V_B = V_i$

$V_C - V_A = R \cdot I = 0 \Rightarrow V_C = V_A$

$\Rightarrow V_A - V_B = \boxed{V_o = V_i}$

DIODO ON





Aplico ley de Mallas $V_i + 0'6\,V - V_1 = 2RI$

$$I = \frac{V_i - 5'4\,V}{2R}$$

Posibilidad 1

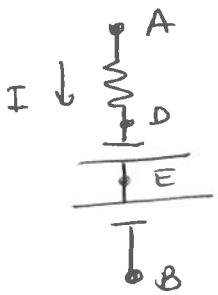
$V_C - V_B = V_i \Rightarrow V_C = V_B + V_i$

$V_C - V_A = R\,I = \frac{V_i - 5'4V}{2} \Rightarrow V_B + V_i - V_A = \frac{V_i - 5'4V}{2}$

$V_B - V_A = \frac{V_i - 5'4V}{2} - V_i \Rightarrow V_o = V_A - V_B = V_i - \frac{V_i}{2} + 2'7V$

$$\boxed{V_o = \frac{V_i}{2} + 2'7V}$$

Posibilidad 2



$V_A - V_D = I \cdot R = \frac{V_i}{2} - 2'7V$

$V_E - V_D = 0'6V \rightarrow V_D - V_E = -0'6V$

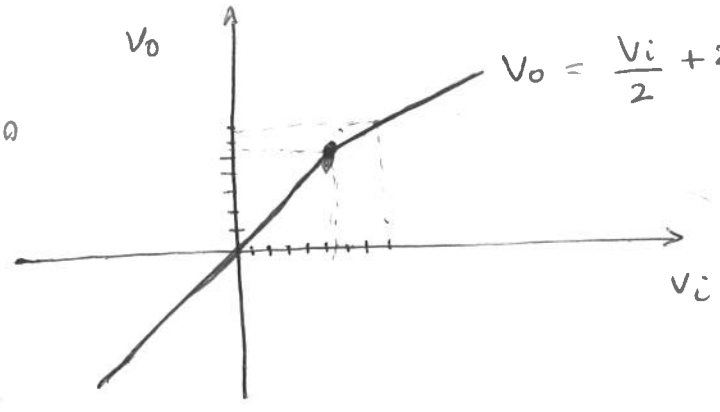
$V_E - V_B = 6V$

$$V_A - V_B = V_o = \boxed{\frac{V_i}{2} + 2'7V = V_o} \qquad 0'3$$

Cambio de comportamiento.

$V_i = \frac{V_i}{2} + 2'7V \Rightarrow \frac{V_i}{2} = 2'7V \Rightarrow \boxed{V_i = 5'4V}$ $\quad 0'2$

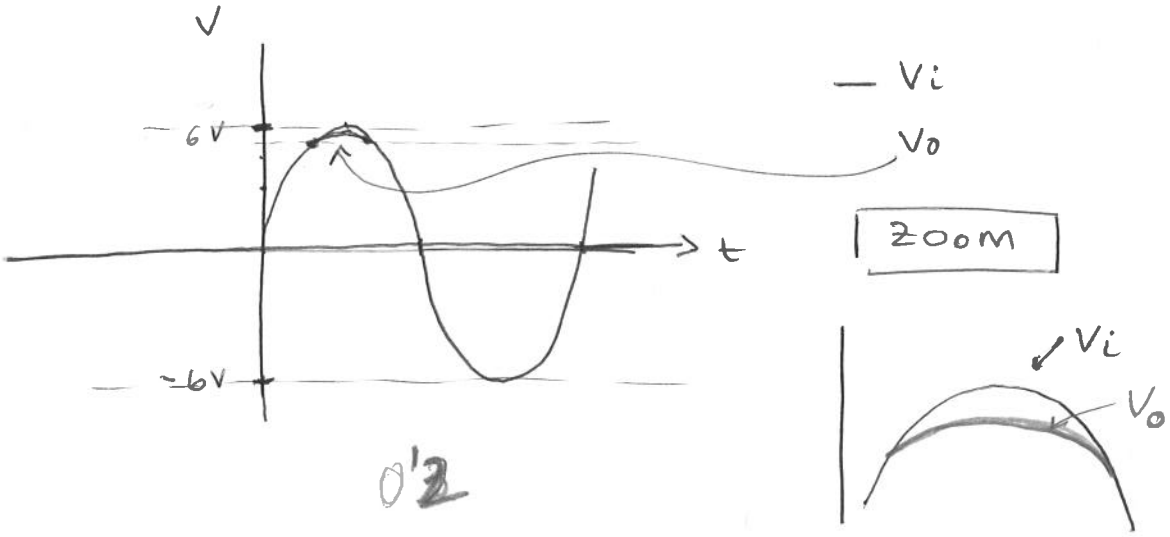
$V_i = V_o$ $\quad V_o = V_o$



$0'3$

$V_o = V_i$

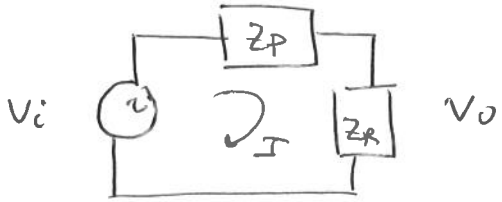
b)



0'2

Independiente de la frecuencia. 0'2

EJERCICIO 6



$$Z_p = \frac{Z_C \cdot Z_R}{Z_R + Z_C}$$

ley de ohm generalizada

$$I\,(Z_p + Z_R) = V_i \Rightarrow I = \frac{V_i}{Z_p + Z_R}$$

$$V_o = Z_R \cdot I = Z_R \frac{V_i}{Z_p + Z_R} \Rightarrow T(\omega) = \frac{V_o}{V_i} = \frac{Z_R}{Z_p + Z_R}$$

0'6

Sustituyo

$$T(\omega) = \frac{R}{\frac{\frac{1}{j\omega C} \cdot R}{R + \frac{1}{j\omega C}} + R} = \frac{1}{\frac{\frac{1}{j\omega C}}{\frac{1 + j\omega CR}{j\omega C}} + 1} =$$

$$T(\omega) = \frac{1}{\frac{1}{1+j\omega CR} + 1} = \frac{1+j\omega CR}{1+1+j\omega CR} =$$

$$= \frac{1+j\omega CR}{2+j\omega CR} = \frac{1}{2} \cdot \frac{1+j\omega CR}{1+j\frac{\omega CR}{2}} = \frac{1}{2} \frac{1+j\frac{\omega}{\omega_{01}}}{1+j\frac{\omega}{\omega_{02}}}$$

$$\omega_{01} = \frac{1}{CR} = \frac{1}{10^{3} \cdot 10 \cdot 10^{-9}} = 10^{5} \frac{rad}{s}$$

$$\omega_{02} = \frac{2}{CR} = 2\,10^{5} \frac{rad}{s}$$

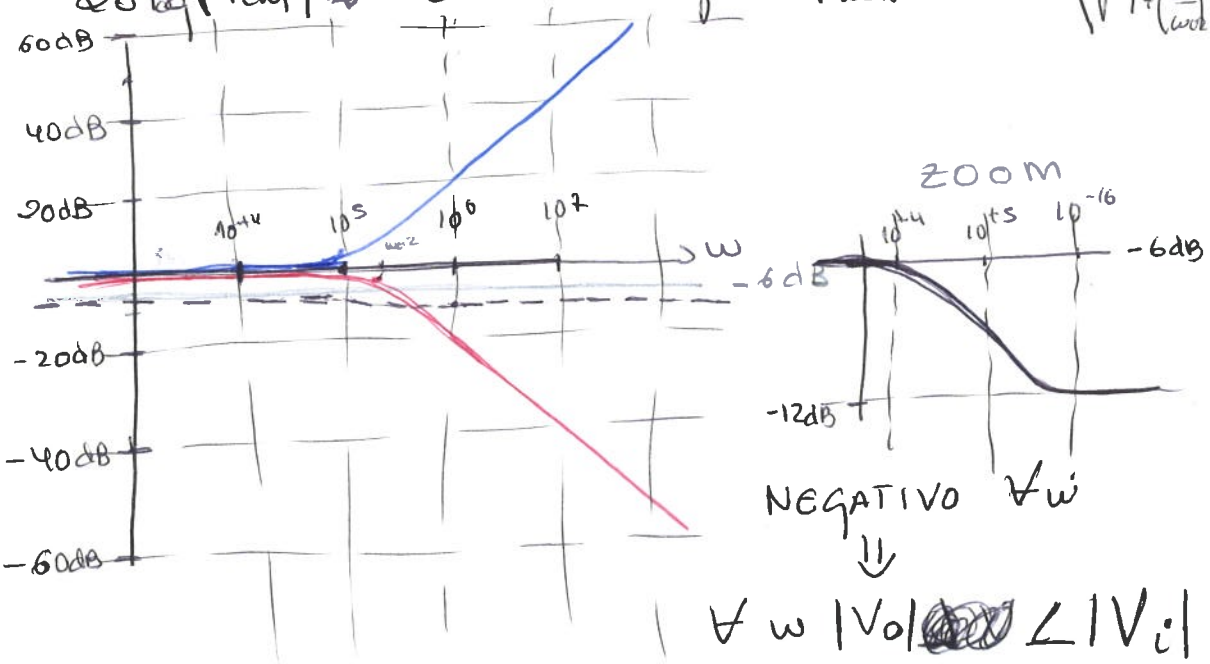
$$|T(\omega)| = \frac{1}{2} \cdot \frac{\sqrt{1+(\omega/\omega_{01})^2}}{\sqrt{1+(\omega/\omega_{02})^2}} \quad 0'2$$

$$\arg(T(\omega)) = 0 + \arctg\left(\frac{\omega}{\omega_{01}}\right) - \arctg\left(\frac{\omega}{\omega_{02}}\right) \quad 0'2$$

b) Representa

$$20\log|T(\omega)| \approx -6dB + 20\log\sqrt{1+\left(\frac{\omega}{\omega_{01}}\right)^2} + 20\log\left(\frac{1}{\sqrt{1+\left(\frac{\omega}{\omega_{02}}\right)^2}}\right)$$

$20\log(|T|)$



0'5

NEGATIVO $\forall\omega$

$\Downarrow$

$\forall\omega \; |V_o| \angle |V_i|$

c) $\boxed{P_m = 0\,W}$

$v_i(t) = 4 \sin\left(10^5 t + \frac{\pi}{4}\right) V$

$P(t) = v_c(t)\, i_c(t)$

$V_i = 4\, e^{j\pi/4}\, V \qquad \omega = 10^5 \frac{rad}{s}$

0'75

$$V_c = I \cdot Z_p = \frac{V_i}{Z_p + Z_R} \cdot Z_p \quad \#$$

$$Z_p(\omega = 10^5) = \frac{R \frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} = \frac{R}{1 + R j\omega C} = (500 - j\,500)\,\Omega$$

$$= 707'11\, e^{-j\,0'7854}\,\Omega$$

$V_c = (1'6971 + 0'5657\, i)\, V = \cancel{1'32182\, \phi}$ $\boxed{1'79\, e^{j\,0'32}\, V = V_c}$

$\boxed{v_c(t) = 1'79 \sin(10^5 t + 0'32)\, V}$ 0'25

$$I_c = \frac{V_c}{Z_c} = j\omega C \cdot V_c = (-0'0006 + i\,0'0017)\, A$$

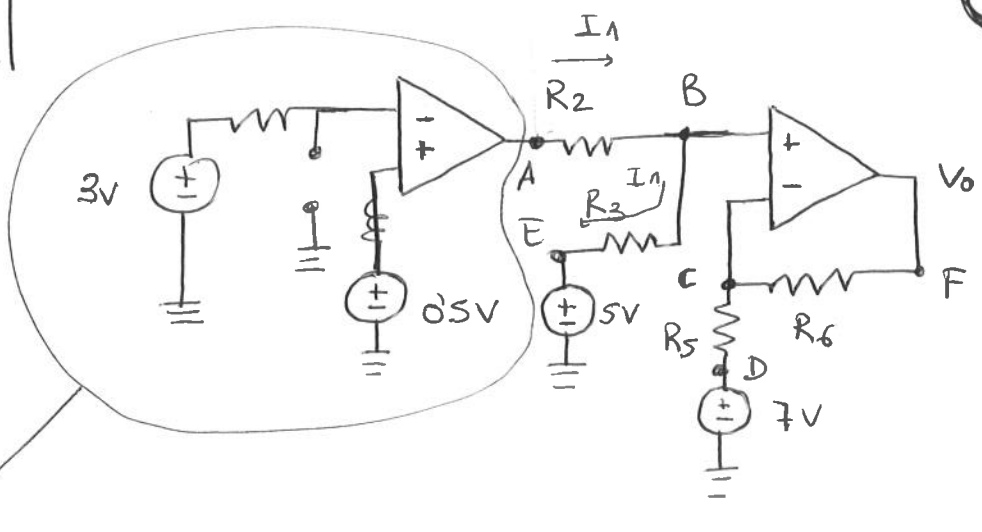
$$= \boxed{0'0018\, e^{j\,1'8925}\, A = I_c}$$ 0'25

$\boxed{i_c(t) = 0'0018 \sin(10^5 t + 1'8925)\, A}$

$\boxed{P_c(t) = v_c(t)\, i_c(t) = 0'0032 \sin(10^5 t + 0'32) \sin(10^5 t + 1'8925)\, W}$

$P_m = 0$ ← 0'25

EJERCICIO 7



~~Como~~

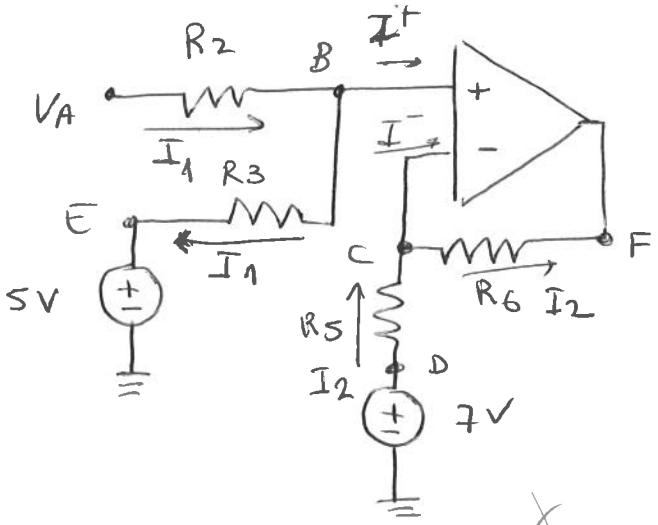
Comparador ⇒ Como $V^- > V^+$ ⇒ $V_o = -V_{cc} = -15V$

3" 0'5V

0'4

Solo ecuaciones 0'5

$V_A = -15V$



A.O. ideal lineal y realimentación negativa

$I^+ = I^- = 0A$

$V^+ = V^- \Rightarrow V_B = V_C$

0'15

$\frac{V_A - V_B}{R_2} = \frac{V_B - V_E}{R_3} \Rightarrow -15V - V_B = V_B - 5V$ +0'35

$-15V + 5V = 2V_B \Rightarrow -10V = 2V_B \Rightarrow V_B = -5V$

$\frac{V_D - V_C}{R_5} = \frac{V_C - V_F}{R_6} \Rightarrow 7V - (-5V) = -5V - V_F$ 0'35

$V_F = -5V - 5V - 7V = -17V$

$\boxed{V_o = -17V}$