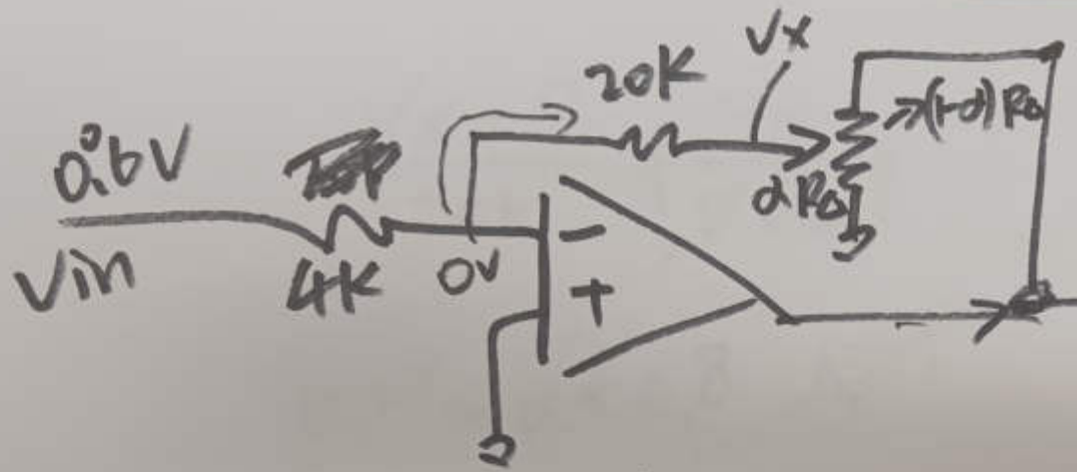
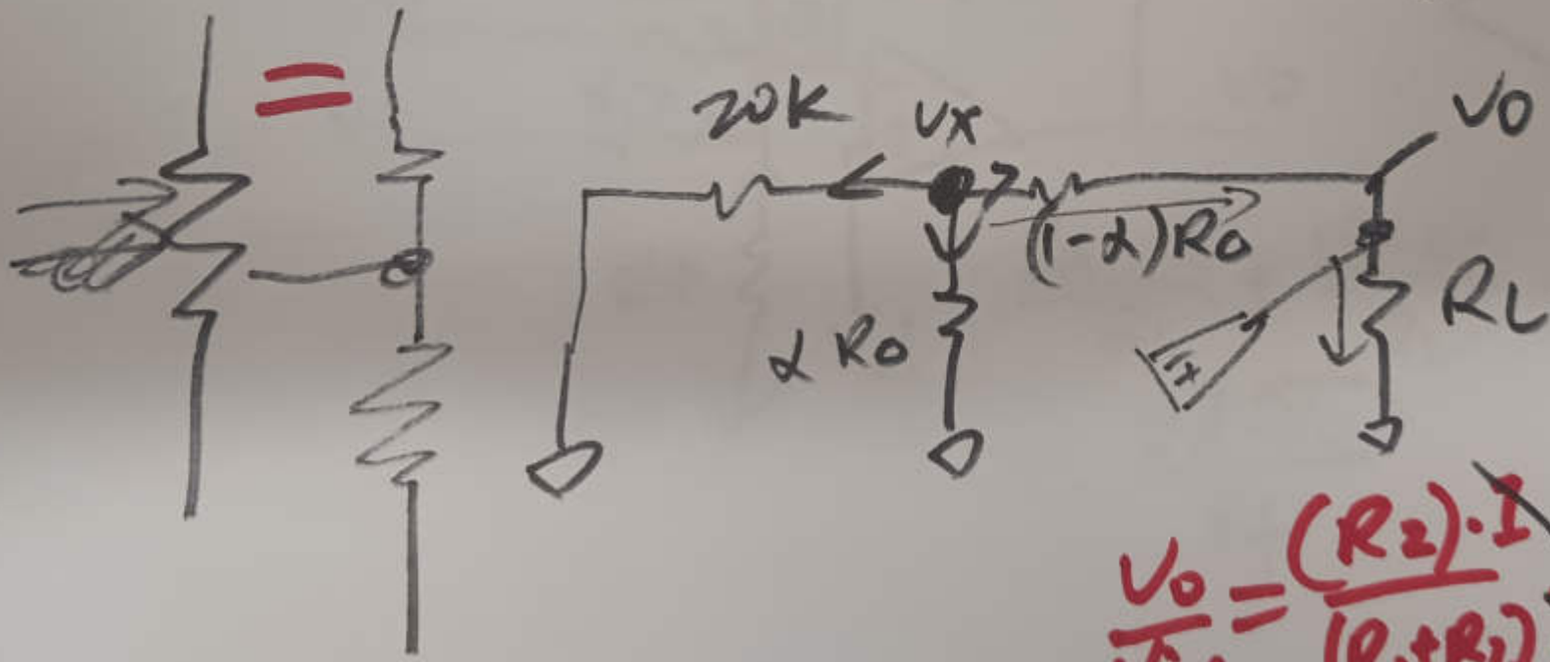


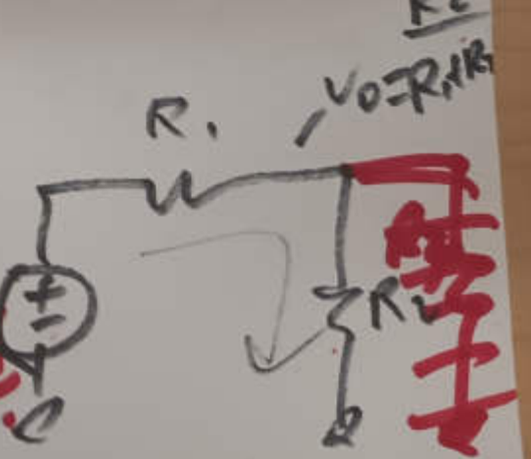

$R_o = 120K$

$$V_x \cong 0.6 \cdot \frac{20k}{4K} = -0.3V$$

$$V_o = V_x \cdot \frac{R_L}{R_L + (1-\alpha)R_o}$$




$$\frac{V_o}{V_{in}} = \frac{(R_2)\cdot I}{(R_1+R_2)\cdot I}$$




$V_o = \frac{R_2}{R_1+R_2} V_{in}$

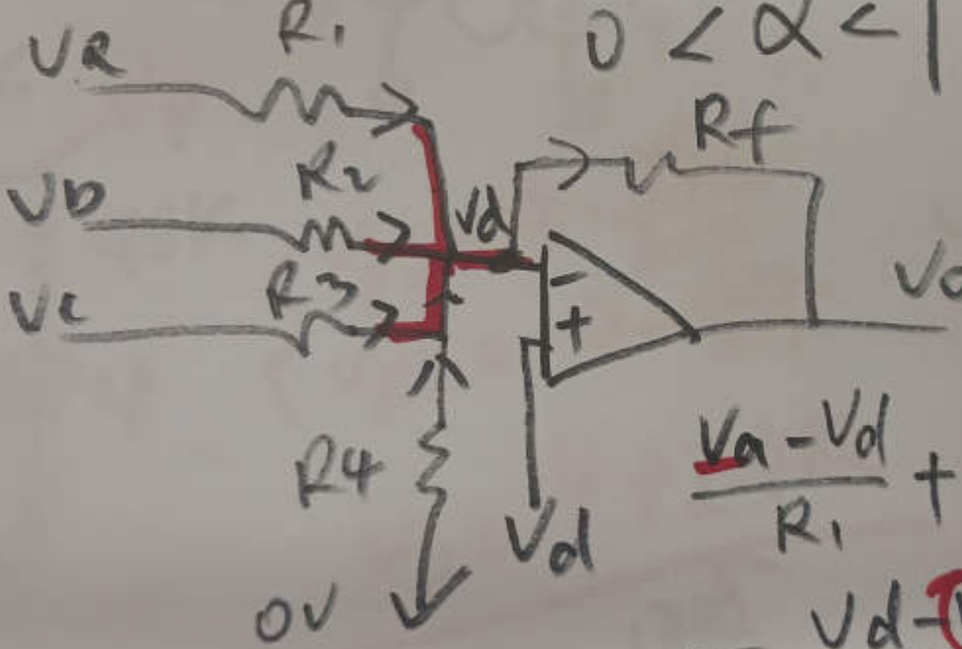
(1)

$$\frac{V_x - 0}{20K} + \frac{V_x}{\alpha R_0} + \frac{V_x - V_o}{(1-\alpha)R_0} = 0$$

$+12$
$-12$

$0.25 < \alpha < 0.8$

$0 < \alpha < 1$

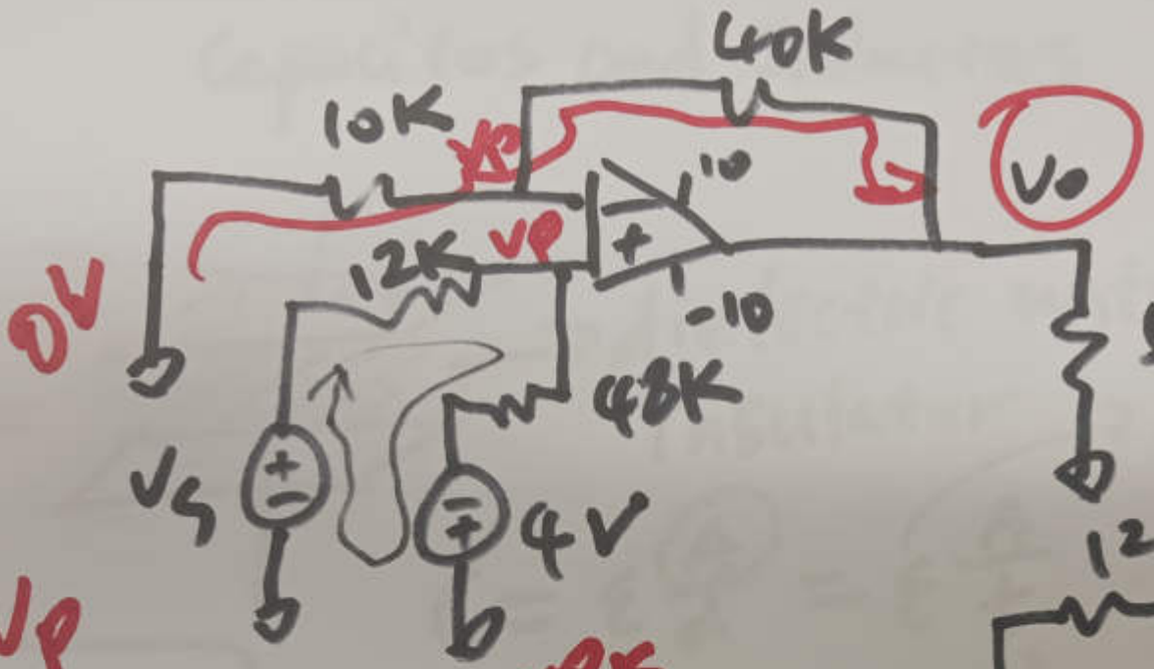


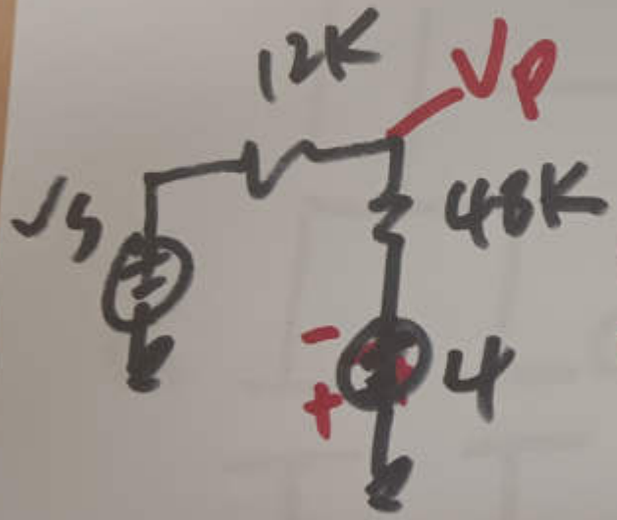

negative feedback

infinite $A_{OL}$

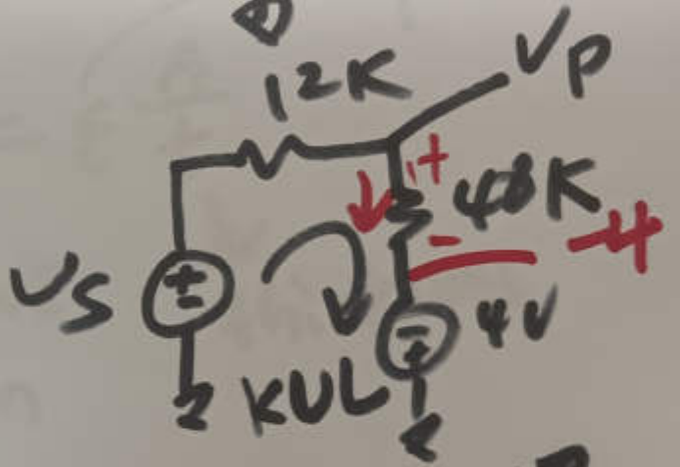
$$\frac{V_a - V_d}{R_1} + \frac{V_b - V_d}{R_2} + \frac{V_c - V_d}{R_3} + \frac{0 - V_d}{R_4} = \frac{V_d - V_o}{R_f}$$

(2)




$$\begin{cases} V_{p1} = V_s \cdot \frac{48K}{60K} \\ V_{p2} = -4 \cdot \frac{12K}{60K} \end{cases}$$




$$-V_s + I \cdot 12K + I \cdot 48K - 4V = 0$$

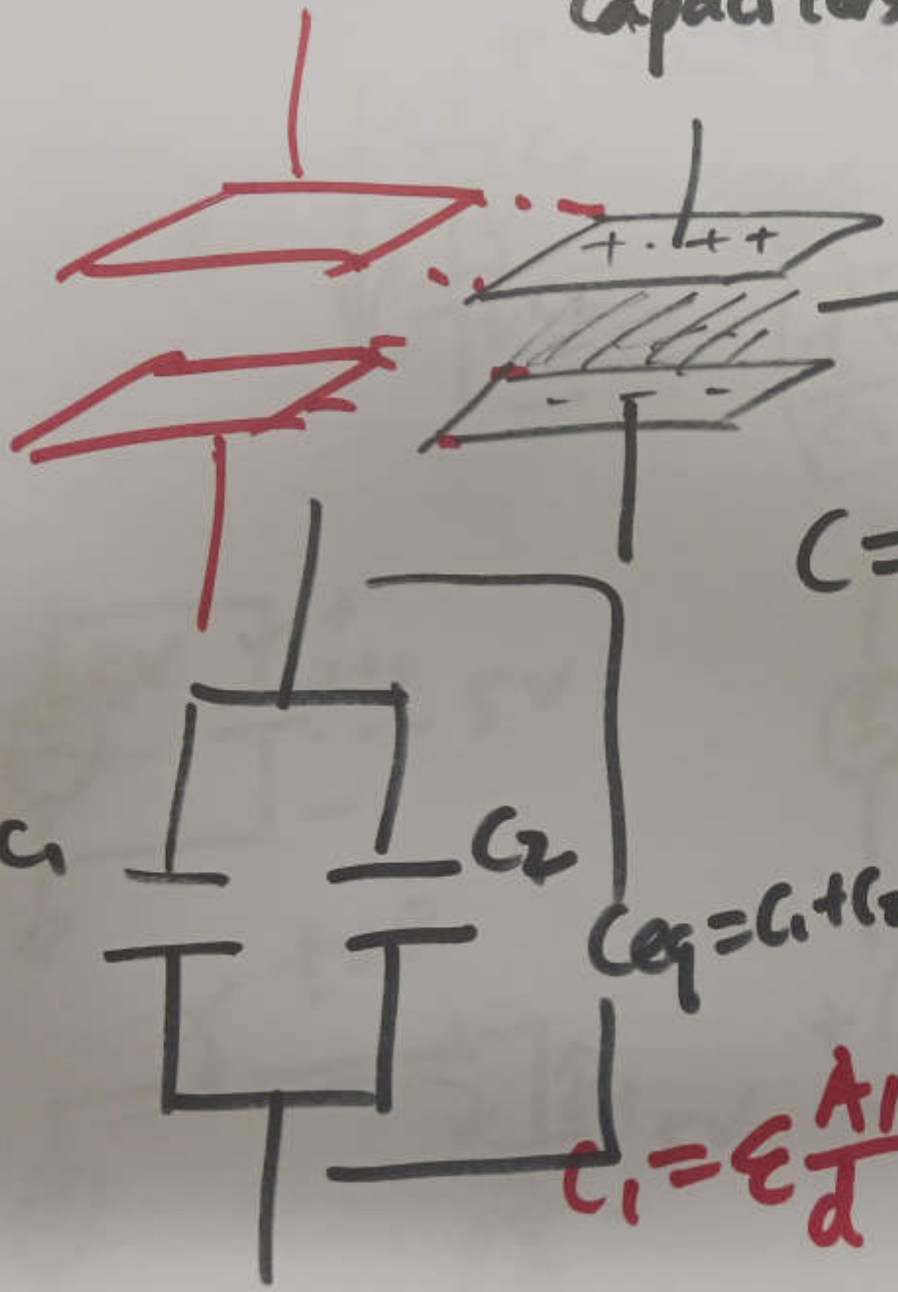
$$I = \frac{V_s + 4}{60K}$$

$$V_p = \frac{-4 + I \cdot 48K}{\frac{48K}{60K} + (-4) \cdot \frac{12K}{60K}}$$

$$V_p = V_s \cdot \frac{48K}{60K} + (-4) \cdot \frac{12K}{60K}$$

(3)

# Capacitors and Inductors




→ dielectric material
insulator → epsilon

$$C = \varepsilon \frac{A}{d} = \varepsilon \frac{A}{t}$$

distance between the two plates

thickness

$$C_1 = \varepsilon \frac{A_1}{d} \qquad C_2 = \varepsilon \frac{A_2}{d}$$

$$C_1 + C_2 = \frac{\varepsilon}{d}(A_1 + A_2)$$

$i = C_{eq}\frac{dv}{dt} = C_{eq}\left(\frac{dv_1}{dt} + \frac{dv_2}{dt}\right)$

$i = C\frac{dv}{dt}$

$\frac{i}{C_1} = \frac{dv_1}{dt}$

$= C_{eq}\left(\frac{i}{C_1} + \frac{i}{C_2}\right)$

$1 = C_{eq}\left(\frac{1}{C_1} + \frac{1}{C_2}\right)$

$C_{eq} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$

$V = L\frac{di}{dt}$

5V 5V

t=0

5V

$R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$

(5)