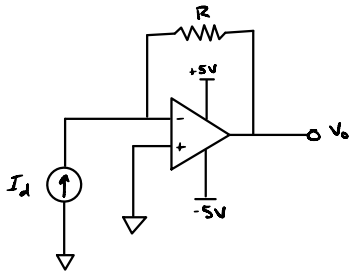
Joaquin Salas Prc-lab 4 ECEN-214-502 March 2, 2023



A.

(a) Find V_o as a function of R and I_d

- $+5V = -5V = 0V \rightarrow -\frac{V_o}{R} = I_d$

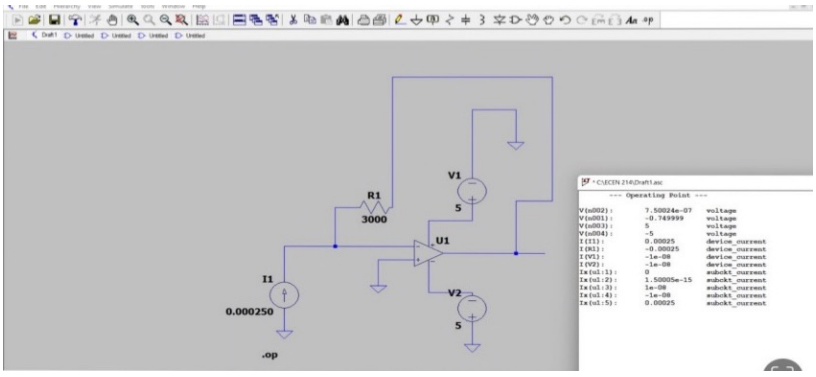
$\rightarrow -I_d - \frac{V_o}{R} = 0 \rightarrow V_o = -I_d \cdot R$

(b) IF $I_d = 250\mu A$ & Desired $V_o = -0.75\,V$, find R.

Rearrange to solve for R

$$R = \frac{V_o}{-I_d} = \frac{-0.75V}{-250\times10^{-6}A} = 3000\,\Omega$$

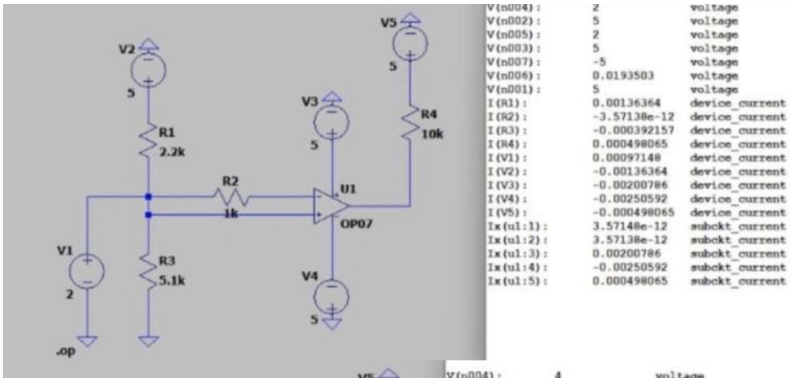
(c) Spice Simulation



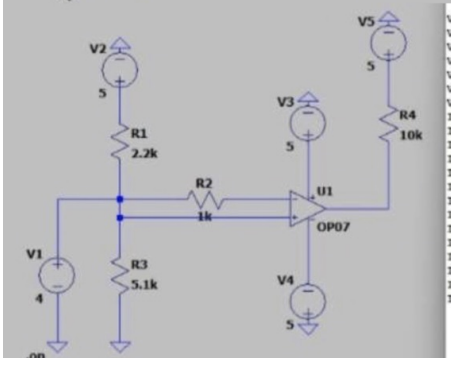
B. node $V_r = V_{in} \times \frac{R_1}{R_1 + R_2}$

$\rightarrow V_r = 5 \times \frac{5.1}{2.2+5.1} = 3.49\,V$

C. Spice with $V_i = 2V$ & $4V$



V(n004):	2	voltage
V(n002):	5	voltage
V(n005):	2	voltage
V(n003):	5	voltage
V(n007):	-5	voltage
V(n006):	0.0193503	voltage
V(n001):	5	voltage
I(R1):	0.00136364	device_current
I(R2):	-3.57138e-12	device_current
I(R3):	-0.000392157	device_current
I(R4):	0.000498065	device_current
I(V1):	0.00097148	device_current
I(V2):	-0.00136364	device_current
I(V3):	-0.00200786	device_current
I(V4):	-0.00250592	device_current
I(V5):	-0.000498065	device_current
Ix(u1:1):	3.57148e-12	subckt_current
Ix(u1:2):	3.57138e-12	subckt_current
Ix(u1:3):	0.00200786	subckt_current
Ix(u1:4):	-0.00250592	subckt_current
Ix(u1:5):	0.000498065	subckt_current



V(n004):	4	voltage
V(n002):	5	voltage
V(n005):	4	voltage
V(n003):	5	voltage
V(n007):	-5	voltage
V(n006):	-4.02982	voltage
V(n001):	5	voltage
I(R1):	0.000454545	device_current
I(R2):	-7.14276e-12	device_current
I(R3):	-0.000784314	device_current
I(R4):	0.000902982	device_current
I(V1):	-0.000329768	device_current
I(V2):	-0.000454545	device_current
I(V3):	-0.00182119	device_current
I(V4):	-0.0027241	device_current
I(V5):	-0.000902982	device_current
Ix(u1:1):	7.14295e-12	subckt_current
Ix(u1:2):	7.14276e-12	subckt_current
Ix(u1:3):	0.00182119	subckt_current
Ix(u1:4):	-0.0027241	subckt_current
Ix(u1:5):	0.000902982	subckt_current