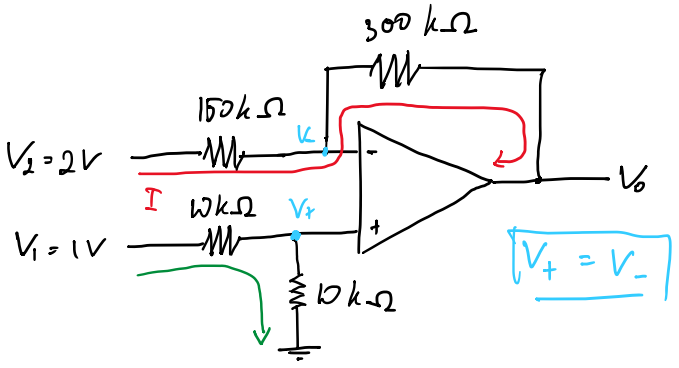
M. Hasyim Abdillah P. 1101196095 TT-43-11

1.



$$V_+ = \frac{10\,k\Omega}{10k\Omega + 10k\Omega} \cdot V_1 = \frac{1}{2} \cdot 1V = 0,5\ V$$

$$V_+ = V_- = 0,5\ V$$

$$I_{150} = I_{300}$$

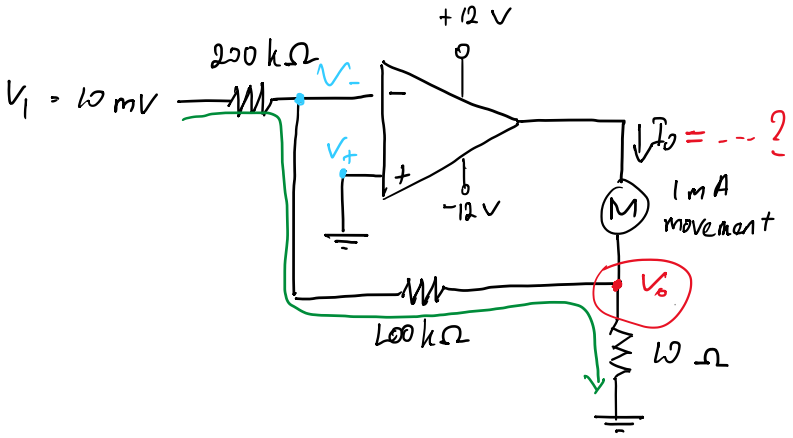
$$\frac{V_2 - V_-}{150k\Omega} = \frac{V_- - V_o}{300k\Omega}$$

$$\frac{2 - 0,5}{1} = \frac{0,5 - V_o}{2}$$

$$3 = 0,5 - V_o$$

$$V_o = -2,5\ V$$

2.



$R_1 = 200\,k\Omega$

$R_f = 100\,k\Omega$

$R_s = 10\,\Omega$

$V_+ = V_- = 0\ V$

$$\frac{V_1 - V_-}{R_1} = \frac{V_- - V_o}{R_f}$$

$$\frac{10\,mV - 0}{200\,k\Omega} = \frac{0 - V_o}{100\,k\Omega}$$

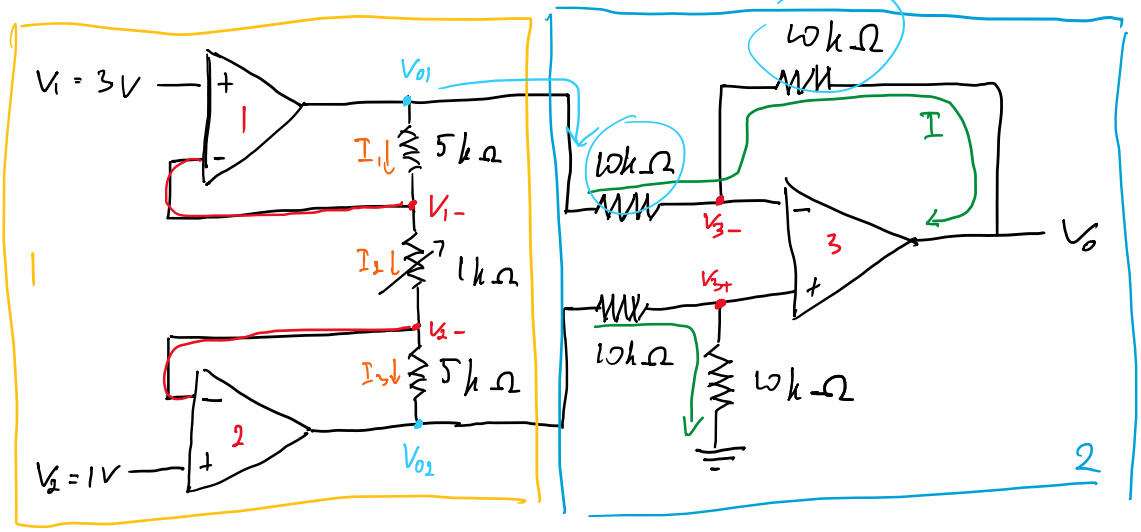
$$V_o = -5\,mV$$

$$I_o = \frac{V_o}{R_s}$$

$$I_o = \frac{-5\,mV}{10\,\Omega}$$

$$I_o = -0{,}5\ mA$$

3.



$$V_{1+} = V_{1-} = 3V$$

$$V_{2+} = V_{2-} = 1V$$

$$I_1 = I_2 = I_3$$

$$\frac{V_{01} - V_{1-}}{R} = \frac{V_{1-} - V_{2-}}{R_p} = \frac{V_{2-} - V_{02}}{R}$$

$$\frac{V_{01} - 3}{5k\Omega} = \frac{3 - 1}{1k\Omega} = \frac{1 - V_{02}}{5k\Omega}$$

$$\frac{V_{01} - 3}{5} \overset{\times 5}{=} 2 \overset{\times 5}{=} \frac{1 - V_{02}}{5} \quad \times 5$$

$$V_{01} - 3 = 10 = 1 - V_{02}$$

$$V_{01} = 13\,V$$

$$V_{02} = -9\,V$$

$$V_{3+} = \frac{10\,k\Omega}{10\,k\Omega + 10\,\Omega} \cdot V_{02}$$

$$V_{3+} = \frac{1}{2} \cdot -9\,V$$

$$V_{3+} = -4{,}5\,V$$

$$V_{3-} = V_{3+} = -4{,}5\,V$$

$$\frac{V_{01} - V_{3-}}{10k\Omega} = \frac{V_{3-} - V_o}{10k\Omega}$$

$$13 - (-4{,}5) = -4{,}5 - V_o$$

$$V_o = 22\,V$$