

q42 ①

$$R_i = 100k\Omega$$

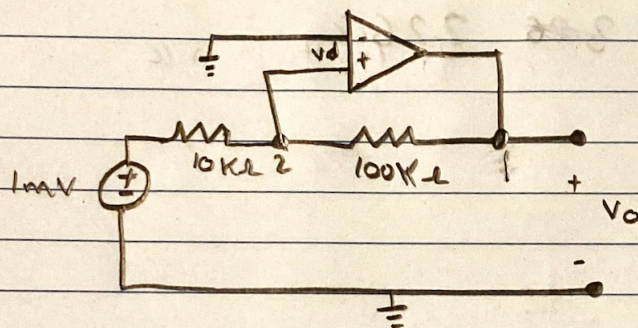
$$A = 100,000$$

$$R_o = 100\Omega$$

$$V_d = ? \quad V_o = ?$$

$$R_1 = 10k\Omega$$

$$R_2 = 100k\Omega$$



KCL at node 1 :

$$\frac{V_o - A V_d}{R_o} + \frac{V_o - (-V_d)}{R} = 0$$

$$V_o = 1000$$

KCL at node 2

$$\frac{-V_d - 10^{-3}}{10k} - \frac{V_d}{100k} - \frac{(V_d + V_o)}{100k} = 0$$

$$100k \times \left[\frac{-V_d}{10k} - \frac{10^{-3}}{10 \times 10^3} - \frac{V_d}{100k} - \frac{V_d}{100k} - \frac{V_o}{100k} \right] = 0$$

$$-10V_d - \frac{1}{100} - V_d - V_d - V_o = 0$$

$$\rightarrow V_o - 12V_d = \frac{1}{100} = 0$$

equation 1:
$$\frac{V_o - 100,000 V_d}{100} + \frac{V_o + V_d}{100 \mu} = 0$$

$$\frac{V_o}{100} - 1000 V_d + \frac{V_o + V_d}{100 \mu} = 0 \quad \times 100 \mu$$

$$1000 V_o - 10^8 V_d + V_o + V_d = 0$$

$$V_d = 10^{-5} V_o$$

Substitute in

$$-V_o - 12 V_d - \frac{1}{100} = 0$$

$$-V_o - 12 \times 10^{-5} V_o - \frac{1}{100} = 0$$

$$\frac{10001}{1000} V_o = \frac{-1}{100}$$

$$V_o = -0.0099$$

$$V_o = -0.01$$

$$V_d = -100 \times 10^{-9} V$$