

## Electronics-I

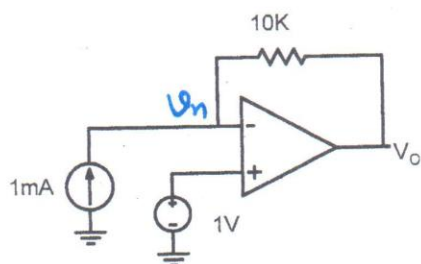
## Quiz 1

Name:

Roll No:

Max Marks. 10

Q1: Determine the output of the ideal op-amp circuits shown below. [3]



KCL at  $V_n$

$$1mA = \frac{V_n - V_o}{10K} \quad [1]$$

$$V_n - V_o = 10V$$

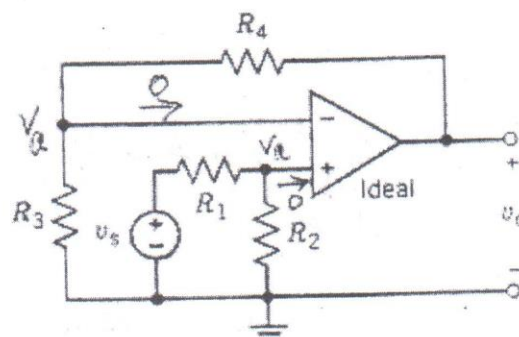
$$\text{But } V_n = V_p = 1V$$

$$\therefore 1 - V_o = 10$$

$$1 - V_o = 10V$$

$$\therefore V_o = -9V \quad [2]$$

Q2: Find the value of  $V_o$  for the circuit given below. If  $R_2 \gg R_1$ , then find the new value of  $V_o$  [3]



$$V_a = \frac{R_2}{R_1 + R_2} V_s$$

$$\text{KCL at } V_a \Rightarrow \frac{V_a}{R_3} + \frac{V_a - V_o}{R_4} + 0 = 0$$

$$\frac{V_o}{V_a} = 1 + \frac{R_4}{R_3} \Rightarrow \frac{V_o}{V_s} = \left( \frac{R_2}{R_1 + R_2} \right) \left( 1 + \frac{R_4}{R_3} \right) \quad [2]$$

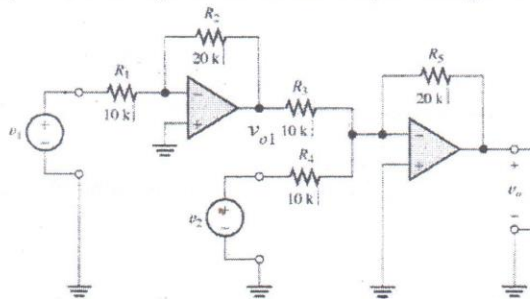
$$\text{If } R_2 \gg R_1, \frac{R_2}{R_1 + R_2} \approx 1$$

$$\therefore \frac{V_o}{V_s} = 1 + \frac{R_4}{R_3} \quad [1]$$

$$V_o = \left( 1 + \frac{R_4}{R_3} \right) V_s$$

Q3: Find an expression for the output voltage of the circuit, shown in Figure below.

[4]



First Op-Amp is inverting  
Amplifier.

$$v_{01} = -\frac{R_2}{R_1} v_1 = -\frac{20k}{10k} \times v_1$$

$$= -2v_1$$

[2]

Second Op-Amp is Summing  
Amp.

$$v_0 = -\left(\frac{R_5}{R_3} v_{01} + \frac{R_5}{R_4} v_2\right)$$

$$= -\left[\frac{20k}{10k} v_{01} + \frac{20k}{10k} v_2\right]$$

$$= -2v_{01} - 2v_2$$

[2]

$$v_0 = 4v_1 - 2v_2$$