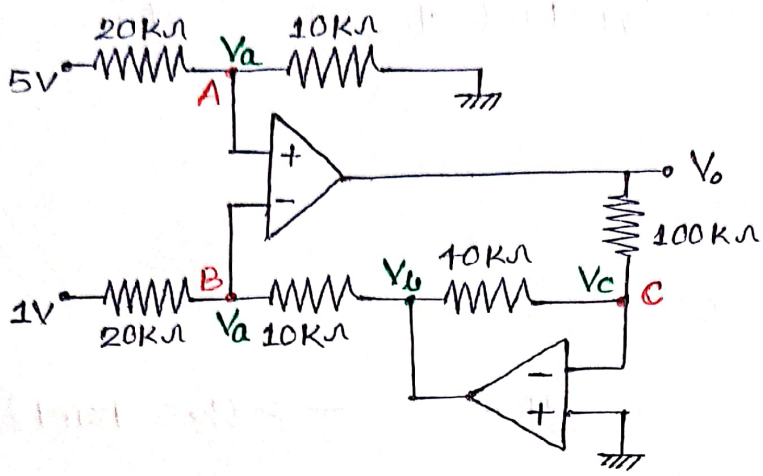
BE QUIZ-5 RUBRIC

SOL(1):



Node A & B both will be on same potential (let V_a) due to virtual short.

$\therefore V_a = \left(\frac{10}{10+20}\right)5$ (at Point/Node-A)

$\therefore V_a = \left(\frac{5}{3}\right)V$ — (a) → (1 Point)

KCL at node B —

$$\frac{V_a - 1}{20} + \frac{V_a - V_b}{10} = 0$$

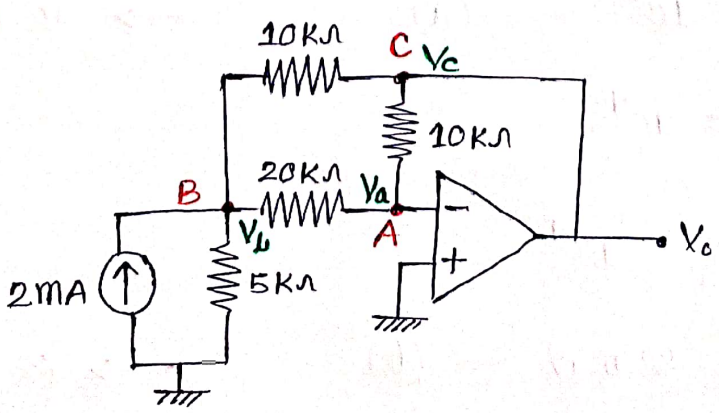
$\therefore V_b = 2V$ — (b) → (2 Point)

KCL at node C —

$$\frac{0 - V_b}{40} + \frac{0 - V_o}{100} = 0 \qquad \because V_c = 0V \text{ (virtual short)}$$

$\therefore V_o = (-5)$ Volt — (c) → (2 Point)

SOL(2):



At Point/Node-C, $V_c = V_o$ —— (a)

At Node-A, $V_a = 0$ V (virtual short) —— (b)

KCL at node A —

$$\frac{V_a - V_b}{20} + \frac{V_a - V_c}{10} = 0$$

$$\frac{0 - V_b}{20} + \frac{0 - V_o}{10} = 0$$

$$\therefore V_b = -2V_o \quad \text{—— (c)}$$ → (2.5 Point)

KCL at node B —

$$\frac{V_b - V_a}{20} + \frac{V_b - V_c}{10} + \frac{V_b}{5} = 2$$

$$\frac{-2V_o - 0}{20} + \frac{-2V_o - V_o}{10} + \frac{-2V_o}{5} = 2$$

$$V_o = -\frac{40}{16}$$

$$\therefore V_o = -2.5 \text{ volt} \quad \text{—— (d)}$$ → (2.5 Point)

SOL(3):

$$\text{Power gain} = \frac{\text{Output Power}}{\text{Input Power}}$$

$$A_p = \frac{P_o}{P_{in}}$$

$A_p = 40$ dB (Given)

$$10 \log_{10}(A_p) = 40$$

$$\therefore A_p = 10^4 \quad \text{—— (a)}$$ → (2 Point)

$$\frac{P_o}{P_{in}} = 10^4$$

$$\frac{P_o}{2 \times 10^{-6}} = 10^4$$

$$\therefore P_o = 20 \text{ mW} \quad \text{—— (b)}$$ → (3 Point)