



$$\textcircled{1} \quad V_1 = -10V \quad \text{--- (I)}$$

$$\textcircled{2} \quad \frac{V_2 - V_1}{10} + \frac{V_2 - 10}{20} = 0$$

$$\Rightarrow \frac{2V_2 - 2V_1 + V_2 - 2}{20} = 0$$

$$\Rightarrow 3V_2 - 2V_1 = 20 \quad \text{--- (II)}$$

$$V_1 = -10V$$

$$V_2 = 20V$$

$$\textcircled{3} \quad \frac{V_1}{50} + \frac{V_1 - 20}{40} + \frac{V_1 - V_2}{30} = 0$$

$$\Rightarrow \frac{12V + 15V_1 - 300 + 20V_1 - 20V_2}{600} = 0$$

$$\Rightarrow 47V_1 - 20V_2 = 300 \quad \text{--- (III)}$$

$$\textcircled{2} \quad 30 \parallel 20 = Y \frac{30 \times 20}{30 + 20}$$

$$= Y \cdot 12$$

$$\therefore \frac{V_2 - V_1}{12} + \frac{V_2}{5} + \frac{V_2}{10} = 0$$

$$\Rightarrow \frac{2V_1 - 5V_1 + 22V_2 + 6V_2}{60} = 0$$

$$= Y \quad 23V_1 - 5V_1 = 0$$

$$= Y \quad -5V_1 + 23V_2 = 0 \quad \dots \quad \textcircled{11}$$

Analysing $\textcircled{1}$ and $\textcircled{11}$

$$V_1 = 7.0336V$$

$$V_2 = 1.52V$$