



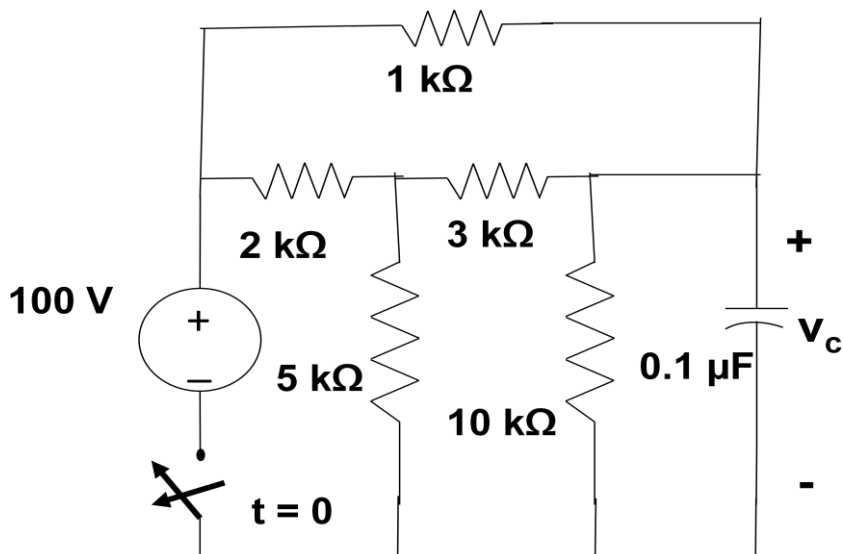
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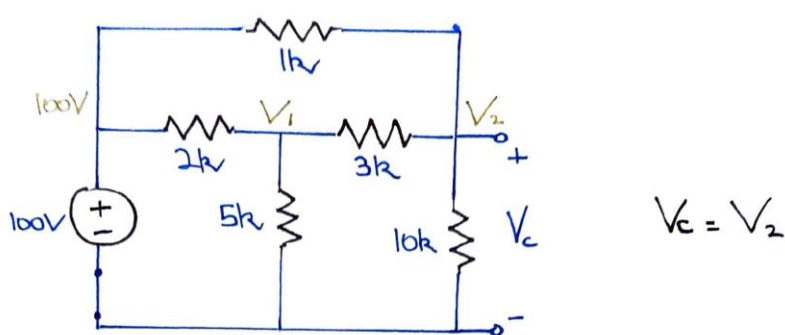
Registration Number and Section: 345834 BEE 12C

**Home Assignment No 5: The General Source-Free RC Circuit (CLO 2)**

The switch in the circuit has been in the closed position for a long time; it is opened at  $t=0$ . Find  $V_c$  at  $t=0^-$ .



For  $V_c(0^-)$ , we assume the instant just before the switch was opened.



KCL at Node 1:

$$\frac{V_2 - 100}{2k} + \frac{V_1}{5k} + \frac{V_1 - V_2}{3k} = 0$$

$$15V_1 - 1500 + 6V_1 + 10V_1 - 10V_2 = 0$$

$$31V_1 - 10V_2 = 1500 \quad (1)$$

KCL at Node 2:

$$\frac{V_2 - 100}{1k} + \frac{V_2 - V_1}{3k} + \frac{V_2}{10k} = 0$$

$$30V_2 - 3000 + 10V_2 - 10V_1 + 3V_2 = 0$$

$$43V_2 - 10V_1 - 3000 = 0$$

$$-10V_1 + 43V_2 = 3000 \quad (2)$$

Upon solving, we get

$$V_1 = 76.64V$$

$$V_2 = 87.59V$$

Hence,

$$V_c(0^-) = 87.59V$$