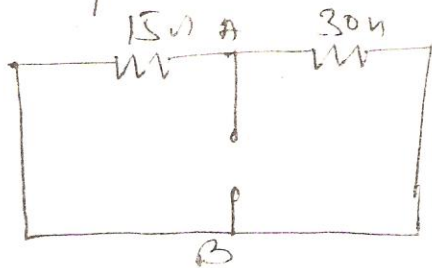


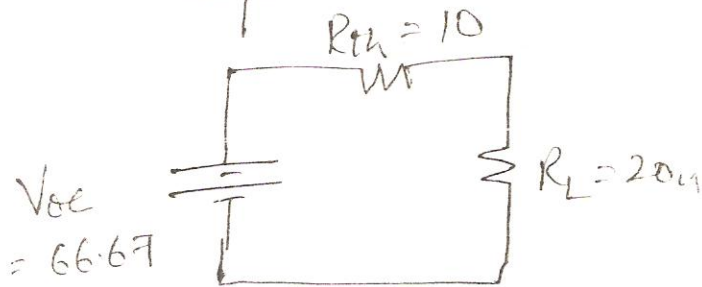
2nd Step — Calculate R_{th}



$$R_{th} = 15 || 30 = \frac{15 \times 30}{15 + 30} = \frac{450}{45}$$

$$R_{th} = 10 \Omega$$

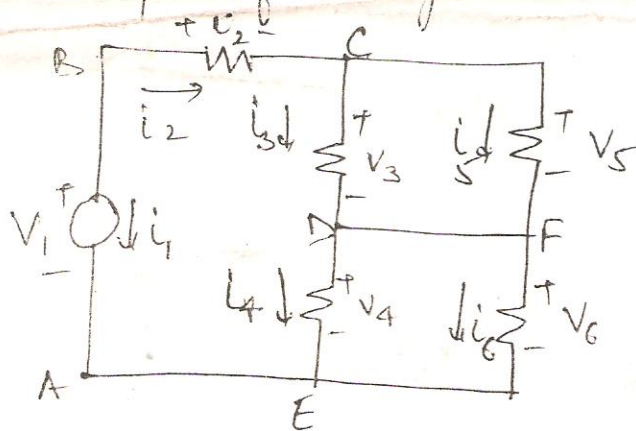
∴ Equivalent Thevenin's circuit is as follows—



$$I_L = \frac{V_{oc}}{R_{th} + R_L} = \frac{66.67}{10 + 20} = \frac{66.67}{30} = 2.22 \text{ amp}$$

∴ $I_L = 2.22 \text{ amp}$

Example of Tellegen's Theorem (Ans 2(a))



Let $v_1 = 7$, $v_2 = 2$ & $v_3 = 7$

Apply KVL in loop ABCDEA

$v_4 = 2$ is required.

Around loop CDFC $v_5 = 3$ is required
 Δ in loop DFED

$v_6 = 2$ is required.

Now apply KCL at node B

let $i_1 = 5$ then it is required $i_2 = -5$ & at node C

let $i_3 = 3$ then i_5 is required, i.e. $i_5 = -8$ & at node D

assume $i_4 = 4$ then i_6 should be equal to -9 .

According to Tellegen's Theorem :-

$$\sum_{k=1}^n v_k i_k = 0$$

$$\therefore = 7 \times 5 + 2 \times (-5) + 3 \times 3 + 2 \times 4 + 3 \times (-8) + 2 \times (-9) = 0$$

Hence Theorem is verified.