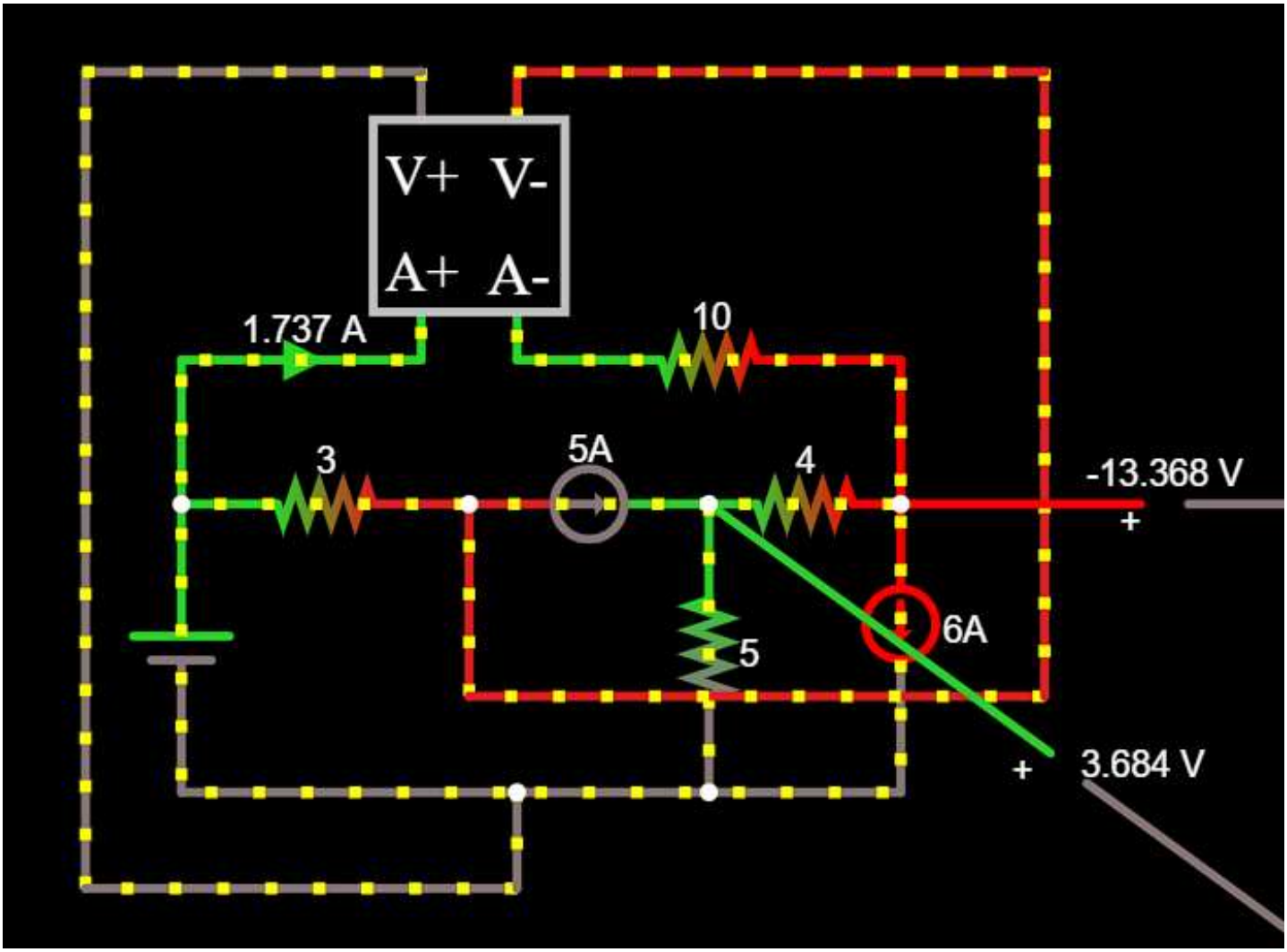
V+ V-
A+ A-
1.737 A
10
3
5A
4
-13.368 V
+
6A
5
+
3.684 V

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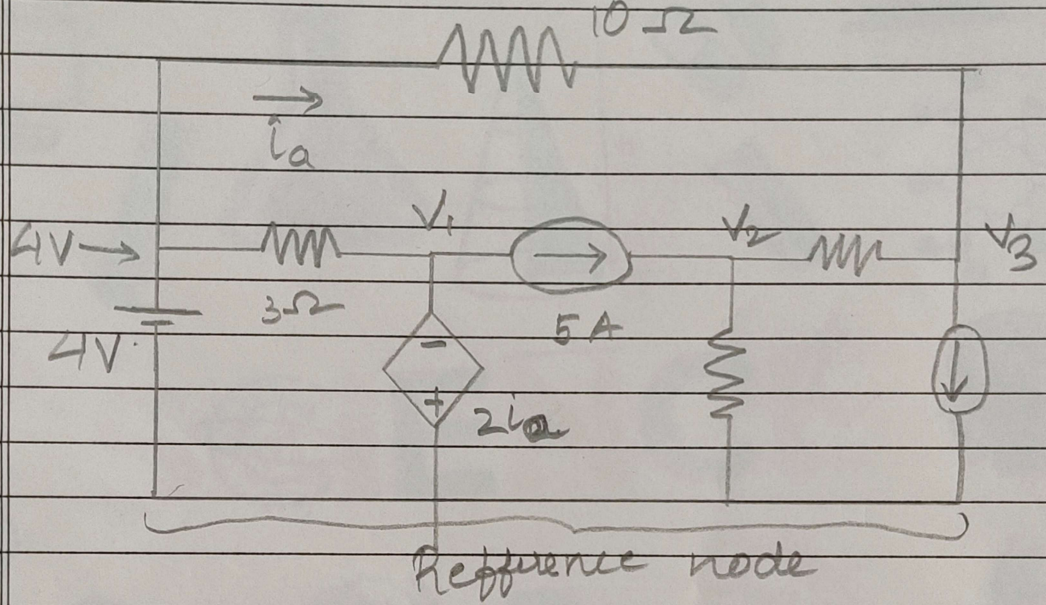
(Q)

→ Solve the given circuit and find i_a (using nodal analysis).



Assume the voltages V_1, V_2, V_3 at these location

Thus applying Nodal analysis at V_1

$$\frac{4 - V_1}{3} = 2i_a + 5 \quad \text{— (2)}$$

$$4 - V_1 = 6i_a + 15 \quad \text{— (2)}$$

$$V_1 + 6i_a = -11 \quad \text{— (1)}$$

$$V_1 + 6i_a = -11 \quad \text{— (1)}$$

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At node V_2

$$5 = \frac{V_2 - V_3}{4} + \frac{V_2}{5}$$

$$100 = 5V_2 - 5V_3 + 4V_2$$

$$\therefore 9V_2 - 5V_3 = 100 \quad \text{—— (2)}$$

At node V_3

$$\frac{4 - V_3}{10} + \frac{V_2 - V_3}{4} = 6$$

$$16 - 4V_3 + 10V_2 - 10V_3 = 240$$

$$10V_2 - 14V_3 = 224 \quad \text{—— (3)}$$

Solving equation (2) & (3) gives

$$V_2 = 3.684$$

$$V_3 = -13.3684$$

$$I_a = \frac{4 - V_3}{10} = \frac{4 - (-13.368)}{10} = \frac{17.368}{10}$$

$$= 1.7368 \text{ A}$$

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