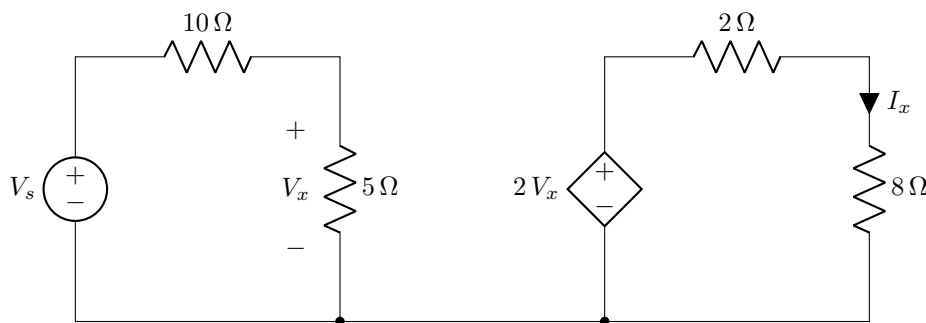


- ✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
- ✓ At the end of the exam, both the **answer script** and the **question paper** must be returned to the invigilator.
- ✓ All **4 questions** are compulsory. Marks allotted for each question are mentioned beside each question.
- ✓ Proper units must be included for all calculated values. Marks will be deducted for missing or incorrect units.
- ✓ Symbols have their usual meanings.

### ■ Question 1 of 4

[CO1] [8 marks]

The  $8\ \Omega$  resistor in the following circuit absorbs  $8\text{ W}$  of power.

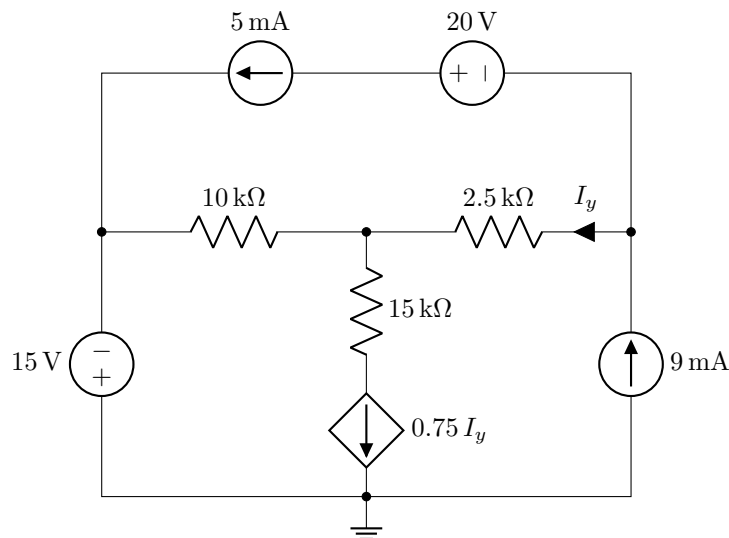


Apply **KCL**, **KVL**, and **Ohm's Law** to answer the following questions–

- (a) [2 marks] Determine the current  $I_x$ .
- (b) [3 marks] Determine the voltage  $V_x$ .
- (c) [3 marks] Determine the source voltage  $V_s$ .

### ■ Question 2 of 4

[CO3] [24 marks]



For the circuit shown above,

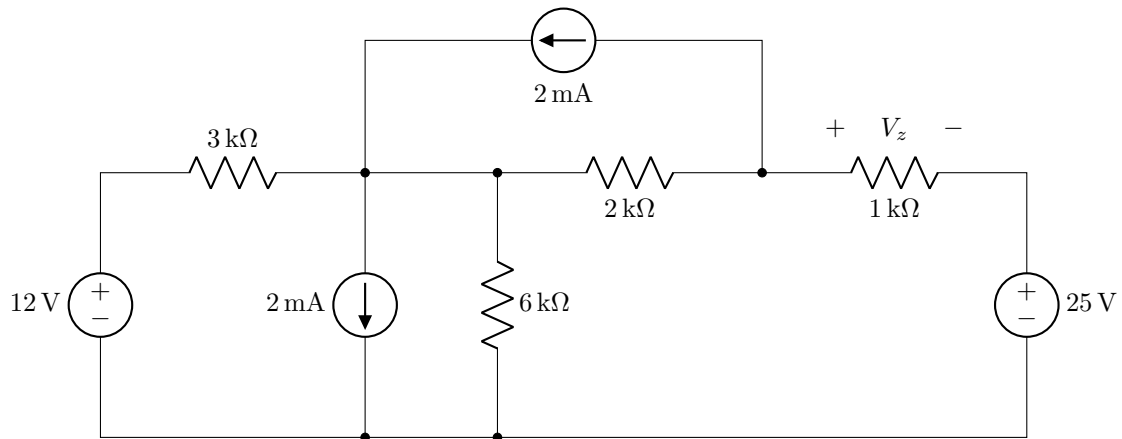
- (a) [16 marks] Apply either **Nodal Analysis** or **Mesh Analysis** to determine the power of (i) the  $5\text{ mA}$  current source and (ii) the  $15\text{ V}$  voltage source with the appropriate  $\pm$  sign and units.<sup>††</sup> Also, mention in each case whether the source is supplying or absorbing power.
- (b) [8 marks] Apply the alternative method that you did not use in (a) to formulate all the equations needed to solve the circuit. You do not need to simplify or solve the equations.

<sup>††</sup>Node voltage or mesh current variables must be labeled on the diagram

### ■ Question 3 of 4

[CO2] [12 marks]

Apply **Source Transformation** to reduce the following circuit to a single loop and then determine  $V_z$ .

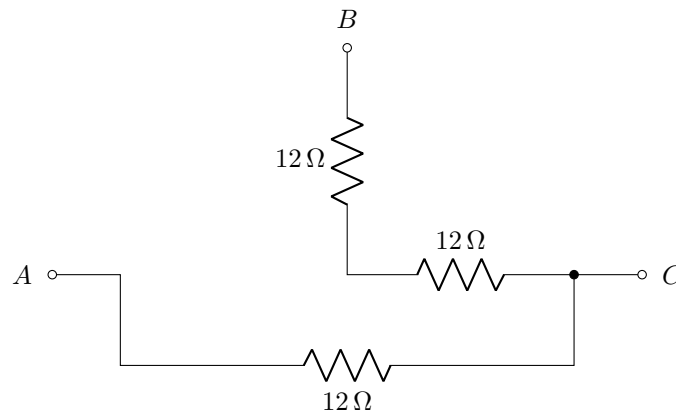


### ■ Question 4 of 4

[CO3] [11 marks]

- (a) [4 marks] You are given four  $12\Omega$  resistors. Three of them are already connected between terminals  $A$ ,  $B$ , and  $C$  as shown below. Complete the circuit by connecting the fourth resistor between two nodes such that the equivalent resistances between the terminals are  $R_{AB} = 20\Omega$ ,  $R_{BC} = 8\Omega$ , and  $R_{AC} = 12\Omega$ .

**Draw** the complete circuit and **verify** that the equivalent resistances between the terminals match the given values.



- (b) [7 marks] **Determine**  $R_{ab}$ , the equivalent resistance between the terminals  $a$  and  $b$  in the circuit shown below.

