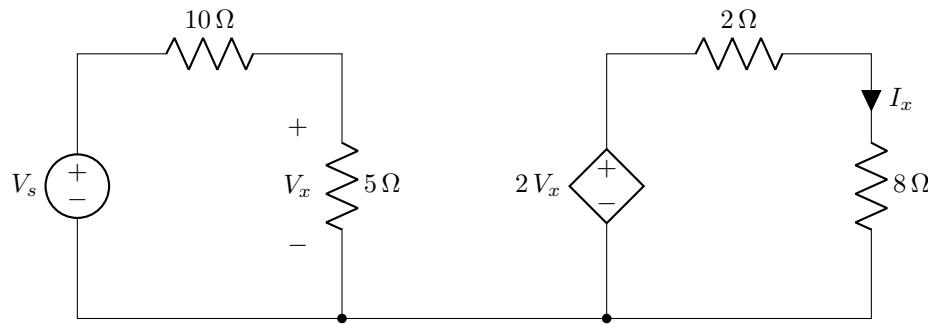


- ✓ No washroom breaks. Phones must be turned off. Using/carrying any notes during the exam is not allowed.
- ✓ At the end of the exam, both the **answer script** and the **question paper** must be returned to the invigilator.
- ✓ All **4 questions** are compulsory. Marks allotted for each question are 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.

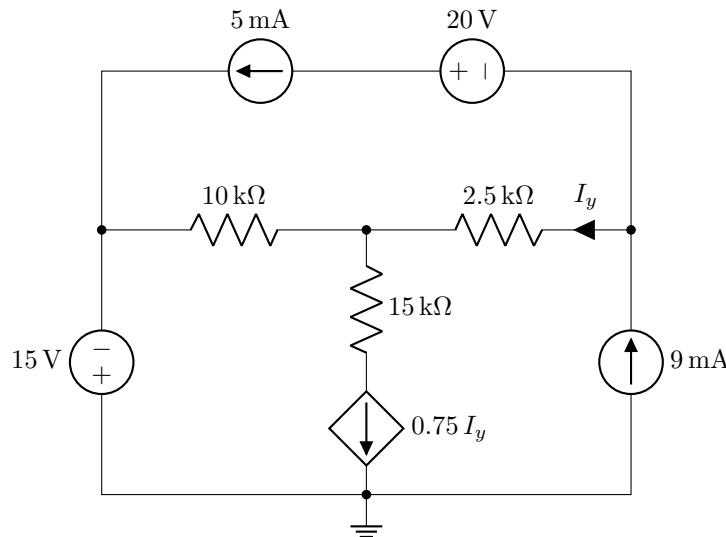
■ Question 1 of 4**[CO1] [8 marks]**

The 8Ω resistor in the following circuit absorbs 8 W of power.



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

- [2 marks] Determine the current I_x .
- [3 marks] Determine the voltage V_x .
- [3 marks] Determine the source voltage V_s .

■ Question 2 of 4**[CO3] [24 marks]**

For the circuit shown above,

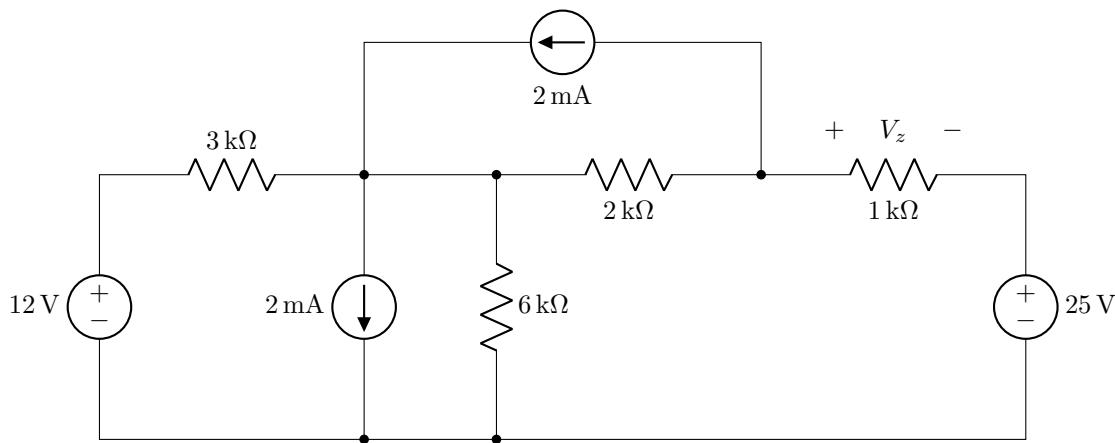
- [16 marks] **Apply** either **Nodal Analysis** or **Mesh Analysis** to determine the power of (i) the 5 mA current source and (ii) the 15 V voltage source with the appropriate \pm sign and units.^{††} Also, mention in each case whether the source is supplying or absorbing power.
- [8 marks] **Apply** 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.

^{††}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 .

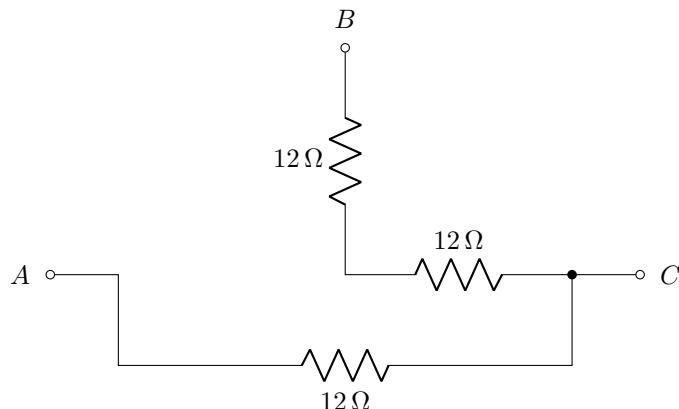


■ Question 4 of 4

[CO3] [11 marks]

- (a) [4 marks] You are given four 12Ω 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.

