Department of Electrical Engineering

Assignment

Date: 14/04/2020

Course detail

Instructor: Dr .sohail imran

Course title Leaner circuit analysis

Module **02**

Total marks **30**

Student Details

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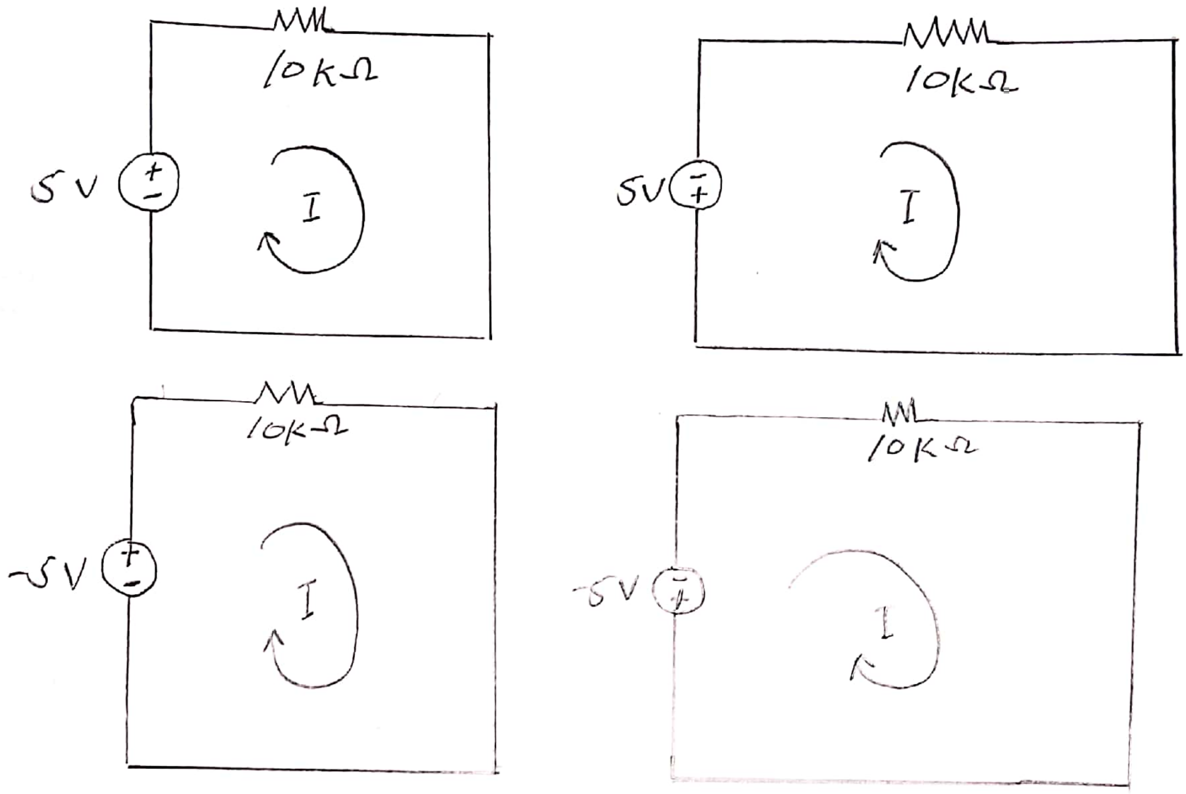
Paper LCA

Q1(a): For each of the ~~following~~ circuits in figure, Find the current I and compute the power absorbed by the resistor.



Ans 1(a):

We use ohm's Law Find circuit

$$V = IR$$

$$I = V/R$$

For power is:

$$P = VI$$

To obtain result so we need to substitute a given values for each circuit. So if current is succeding from negative side to positive of voltage generator. So we practice current voltage with negative sign.

For First circuit:-

$V = IR$

$I = V/R$

$I = 5V/10000\Omega$

$I = 0.0005\,A$

$\boxed{I = 0.5\,mA}$

$P = VI$

$P = 5 \times 0.5 \times 10^{-3}$

$P = 2.5 \times 10^{-3}$

$\boxed{P = 0.25\,mW}$

For 2nd circuit:-

$V = IR$

$I = V/R$

$I = -5V/10000\Omega$

$I = -0.0005\,A$

$\boxed{I = -0.5\,mA}$

2nd Circuit:

Power = ?

$P = VI$

$P = 5 \times (-0.5) \cdot 10^{-3}$

$P = -2.5 \times 10^{-3}$

$P = -0.0025 W$

$\boxed{P = -0.25 mW}$

For circuit 3rd:

$V = IR$

$I = V/R$

$I = -5V / 10000 \Omega$

$I = -0.0005 A$

$\boxed{I = -0.5 mA}$

Power = ?

$P = VI$

$P = 5 \times (-0.5) \times 10^{-3}$

$P = -2.5 \times 10^{-3}$

$\boxed{P = -0.25 mW}$

Circuit 4th :

$V = IR$

$I = V/R$

$I = 5V / 10000\,\Omega$

$I = 0.0005\,A$

$\boxed{I = 0.5\,mA}$

Power = ?

$P = VI$

$P = 5V \times 0.5 \times 10^{-3}$

$P = 2.5 \times 10^{-3}$

$\boxed{P = 0.25\,mW}$

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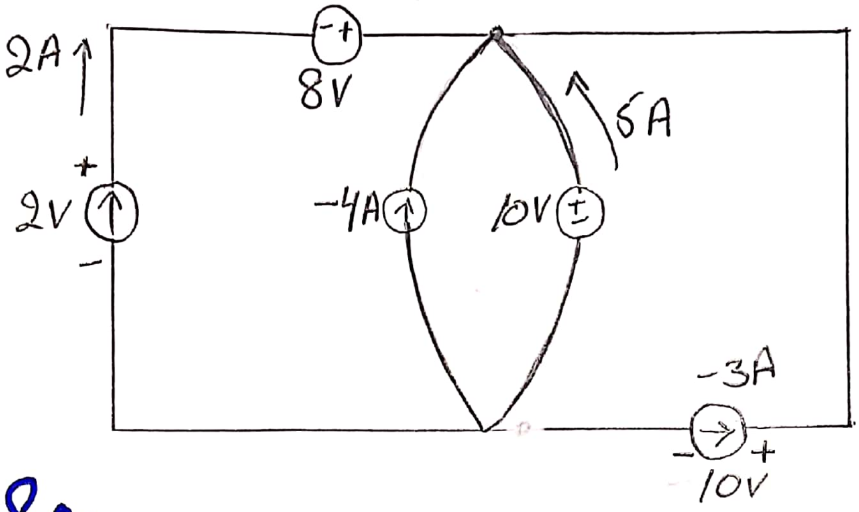
Q1(b): Determine the power supplied by the leftmost element in the circuit of following figure:



Ans:

$P = VI$

$P = 2V \times 2A$

$\boxed{P = 4W}$

Now we could simplify this circuit but as the voltage and current are given we can find the power by multiplying this two vectors.

$(2V)(2A) = \boxed{4W \text{ supplied}}$

Remember that this 4W is supplied power as the current direction conflicts with passive sign convention.

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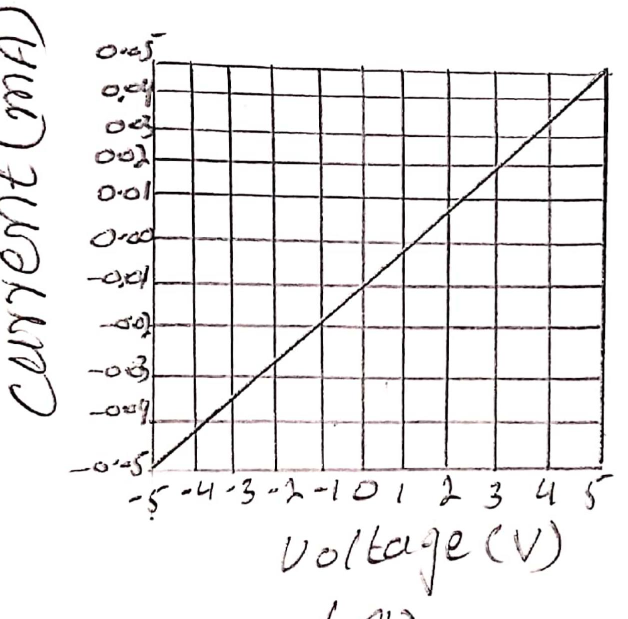
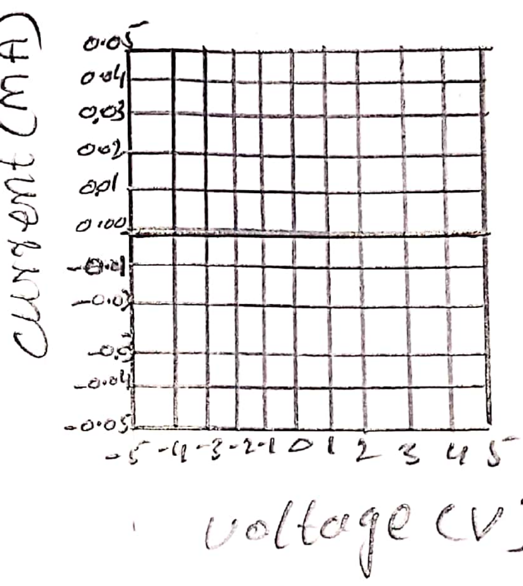
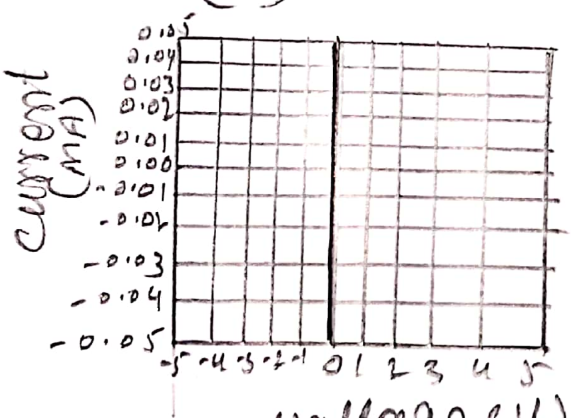
Q1(c) :- Following figure depicts the current-voltage characteristic of three different resistive elements. Determine the resistance of each, assuming the voltage and current are defined in according with the passive sign convention.



(a)



(b)



(c)

ANS :- Use ohm's Law :

$$V = IR$$
(OR)
$$R = V/I$$

So we can calculate R form the slope on the graph.
We can take any point on the line to get the values of "I" and "V".

Calculate (a):

$I = 0.01 mA$
$V = 1 V$
$R = ?$

use ohm's Law

$V = IR$

$R = V/I \Rightarrow \frac{0.5 A}{5 V} \Rightarrow 10 \mu s$

$R = 1V / 0.01 \times 10^{-3}$

$$\boxed{R = 100 k\Omega}$$

Calculate (b):

Through difficult to see, the current is zero as slope is zero (0)

$V = IR \Rightarrow R = V/I$

$R = 1V/0 \Rightarrow \boxed{R = \infty}$

Calculate (C) :-

Through difficult to see the current is infinate.

as slope is ∞ (S)

$$R = \frac{1}{\infty}$$

OR

$$R = 0$$

Thus we have zero resistance

$$\boxed{R = 0}$$

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Q2a): Refer to the circuit of following figures and answer the following:

(1) How many distinct nodes are contained in the circuit?

(2) How many elements are contained in the circuit.

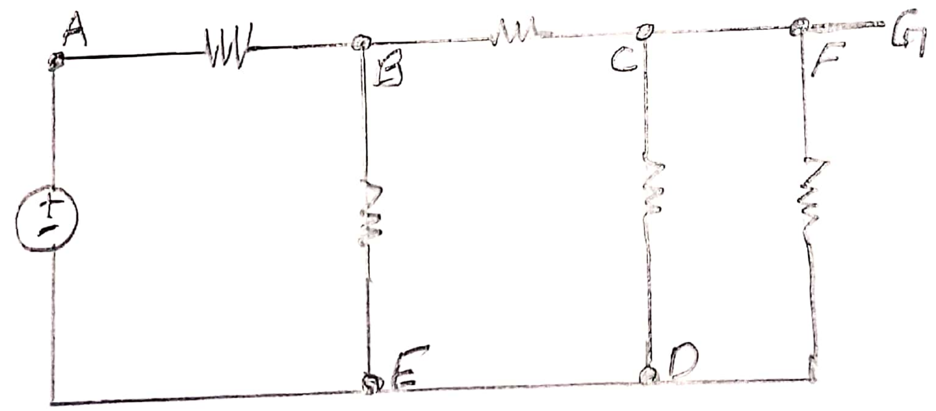
(3) How many branch does the circuit have?

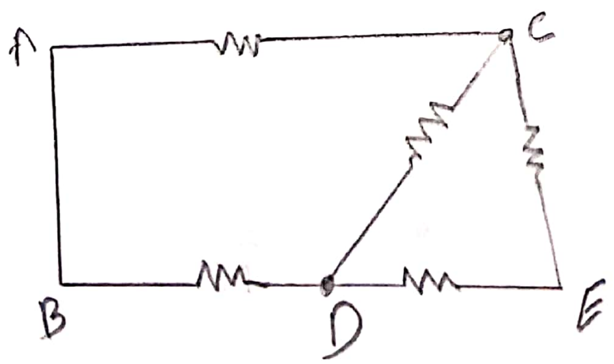
(4) Determine if each of the following represents a path, a loop, both, or neither:

(i) A to B, (ii) B to D to C to E

(iii) C to E to D to B to A to C

(iv) C to D to B to A to C to E





Ans: Next page

Ans 2(a):

(1) We get that the number of nodes in the circuit is (4).

(2) Number of element (5).
(The 5 resistor)

(3) A branch is a section between two nodes. So the number of branch in the circuit is (5).
(The same as the number of active elements).

(4)
(i) Neither, we're still in the same nodes.

(ii) only path, where moved by 3 node and visted each only once.

(iii) path and Loop, where moved by 4 nodes and closed the Loop in node c.

(iv) Neither, where visited node c twice, but didn't finish in it.

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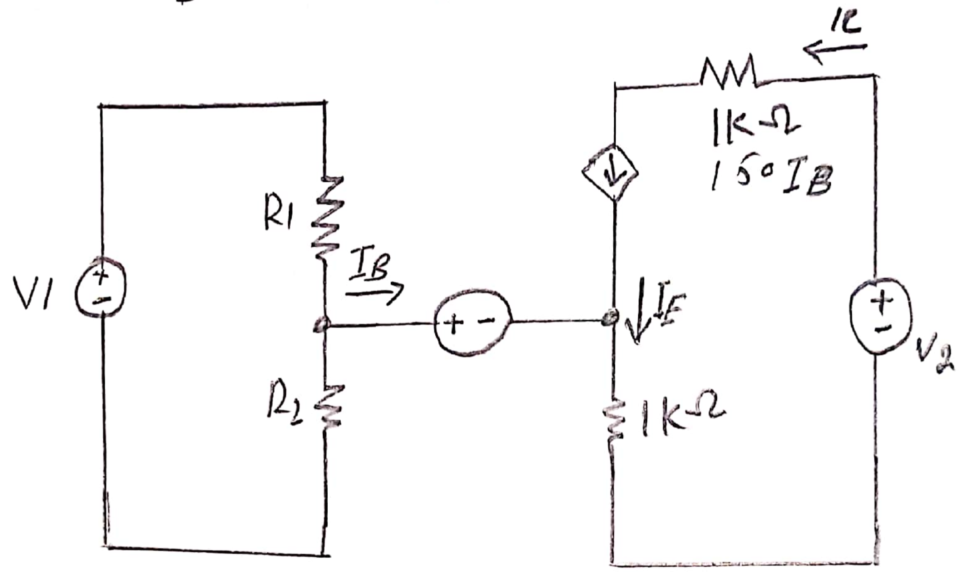
Q2(b): For the circuit of following figure (which is a model for the dc operation of a bipolar junction transistor biased in forward active region), I_B is measured to be 200 μA. Determine I_C and I_E.



ANS 2(b)

KCL, total current entering a node = Total current leaving a node.

$I_B + I_C = I_E$ (OR)

$I_E = I_B + I_C \Rightarrow I_C = 150 \cdot I_B$

$\boxed{I_C = 15\,mA}$

calculate I_E as;

$I_E = 15 \cdot 10^{-3} + 100 \cdot 10^{-6}$

$\boxed{I_E = 15.1\,mA}$

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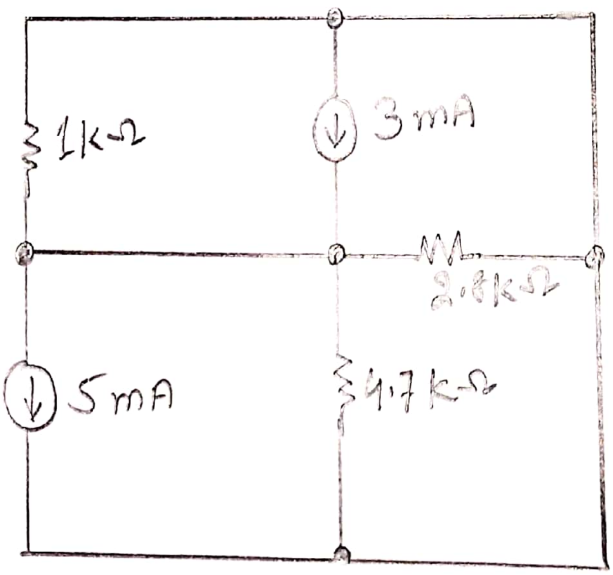
Q 3(a) Although drawn so that it may not appear obvious at first glance, the circuit of the following figure is in fact a single-Node-pair circuit.

(a) Determine the ~~following~~ power absorbed by each resistor.

(b) Determine the power supplied by ~~each~~ each current source.

(c) Show that the sum of the absorbed power calculated in (a) is equal to the sum of the supplied power calculated in (b)



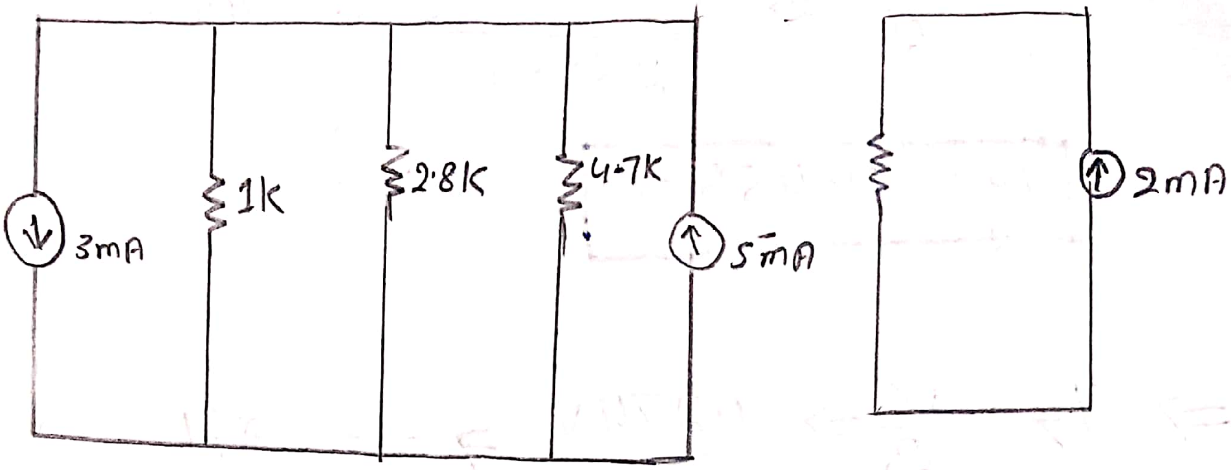
ANS:

Find $P(2.8k\Omega)$, $P(4.7k\Omega)$, $P(1k\Omega)$, $P(5mA)$, $P(3mA)$

Find re vaile in a better force

Find v by combain similar element.

next page

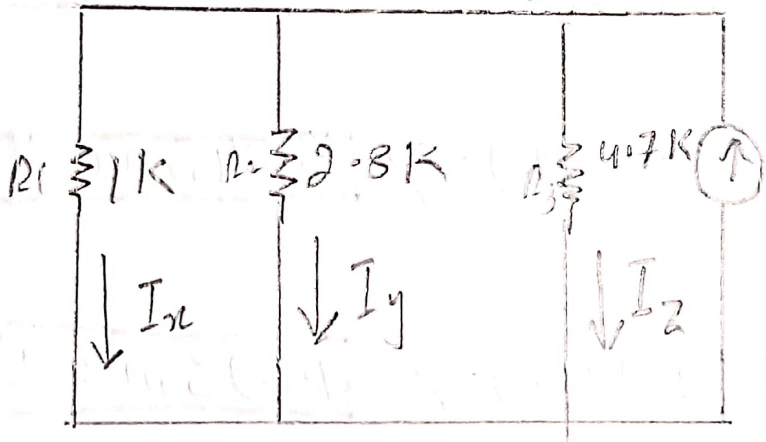


use ohm's law

$$U = IV$$

$$V = 2\times10^{-3} \times 637 = \boxed{1.274V}$$

No its the I of each



$$V = IR$$

$$I = V/R$$

$$I_x = V/R_1 \Rightarrow \frac{1.274V}{1000\,\Omega} \Rightarrow \boxed{1.274mA}$$

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$\Rightarrow I_y = \frac{V}{R_2} \Rightarrow \frac{1.274V}{2800\Omega} \Rightarrow 0.00455$

$I_y = 0.455mA$

$\Rightarrow I_z = \frac{V}{R_3} \Rightarrow \frac{1.274V}{4700} \Rightarrow 0.000271$

$I_z = 0.271mA$

Power: $P = VI$

$\Rightarrow P(2.8K) = (1.274)(0.271) \Rightarrow$ 0.5797 mwatts

$\Rightarrow P(4.7K) = (1.274)(0.271) \Rightarrow$ 0.345 mwatts

$\Rightarrow P(1K) = (1.274)(1.274) \Rightarrow$ 1.623 m watts

$\Rightarrow P(5mA) = (1.274)(-5) \Rightarrow$ -6.37 m watts

$\Rightarrow P(3mA) = (1.274)(3) \Rightarrow$ 3.822 mwatts

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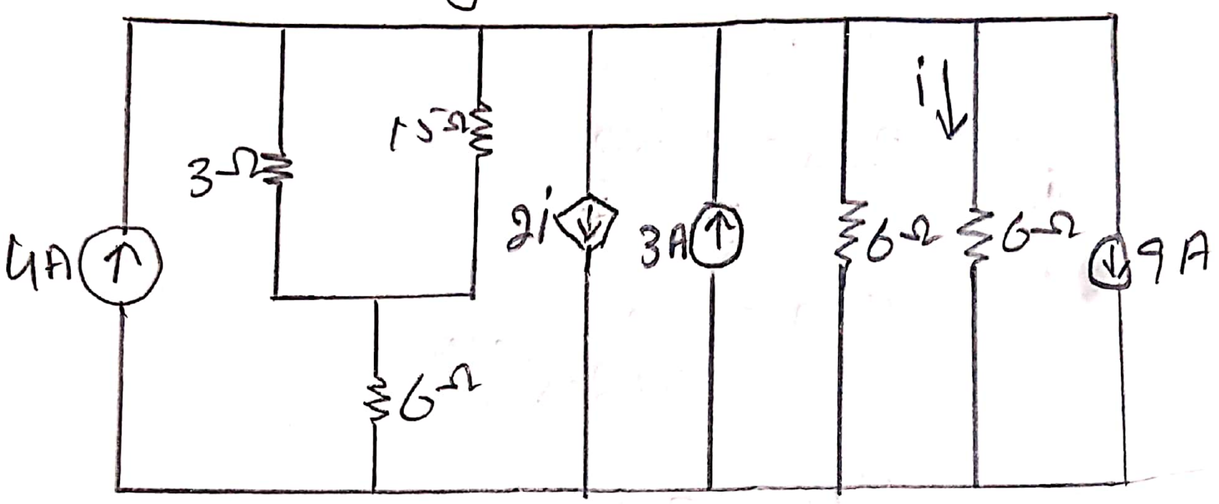
Q3(b) Determine the power absorbed by the 15Ω resistor in the circuit of the following figure.



ANS 3(b): First simply the circuit by calculation source and resistance equalance.

$I_{eq} = 4 - 2i + 3 - 9 = -2 - 2i$

$R_{eq} = (6 + 3 \| 15) \| 6 \| 6$

$R_{eq} = 8.5 \| 3 = 2.2174\,\Omega$

Now we can calculate voltage:

$V = I_{eq} \times R_{eq}$

$V = (-2 - 2i) \times (2.2174\,\Omega)$

and form the diagram we can see that

$V = 6i$

$6i = (-2 - 2i) \times 2.2174)$

$= 10.4348 \times i = -4.4348$

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$j = -0.425A$

$V = -2.55V$

power consumed by The 15-Ω resistor well need the voltage on That resistor That

$$P = V^2/R$$

$$P_{15\Omega} = \frac{V_{15\Omega}^2}{15\Omega}$$

$$V_{15\Omega} = \frac{6}{6+2.5} \cdot V$$

$$V_{15\Omega} = 1.8V$$

and power is;

$$P_{15\Omega} = \frac{1.8^2}{15\Omega}$$

$$P_{15\Omega} = 0.216W$$