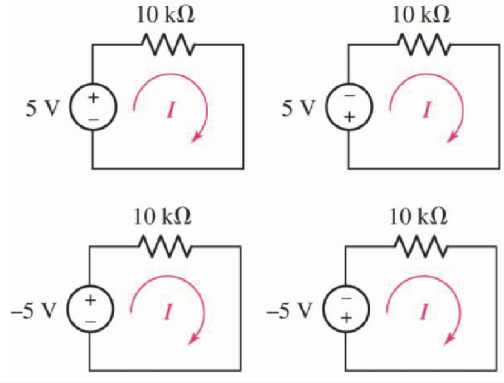
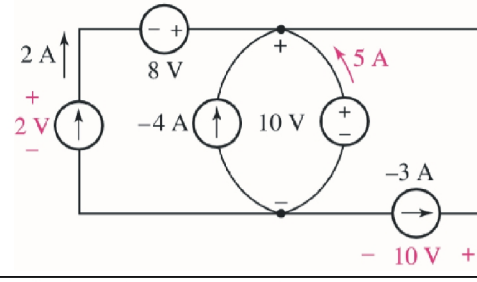
Department of Electrical Engineering
Assignment
Date: 13/04/2020

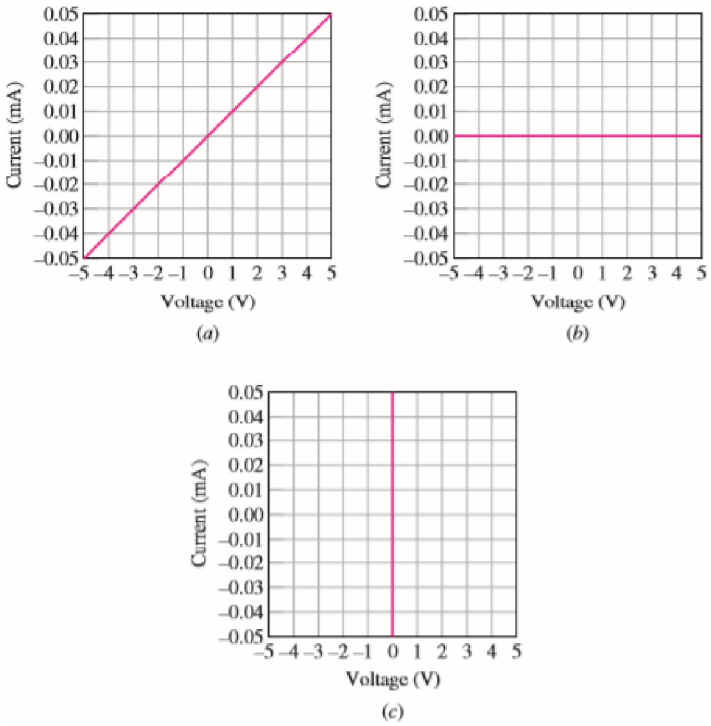
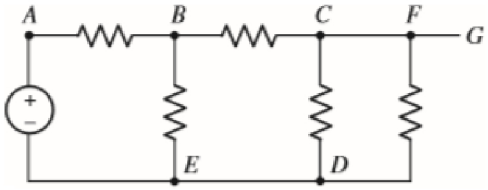
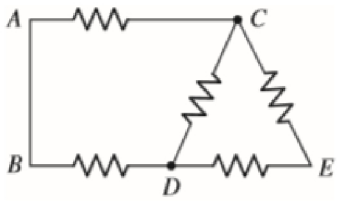
Course Details

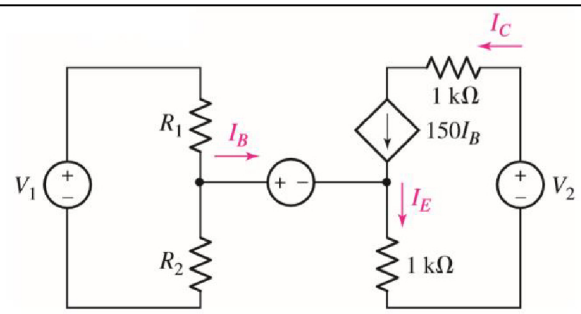
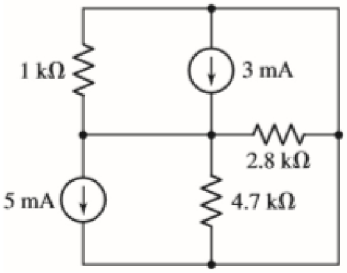
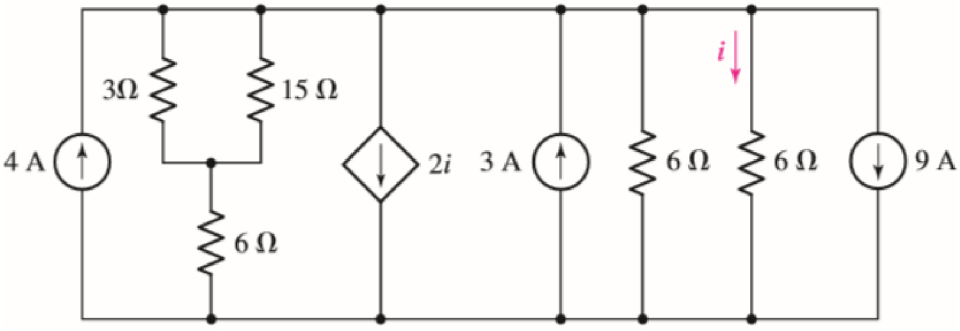
Course Title: Linear Circuit Analysis **Module:** 2
Instructor: **Total Marks:** 30

Student Details

Name: Haseeb Ullah **Student ID:** 16314

Q1.	(a)	For each of the circuits in figure, find the current I and compute the power absorbed by the resistor 	Marks 3 PLO1
	(b)	Determine the power supplied by the leftmost element in the circuit of following figure 	Marks 4 PLO1
	(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 accordance with the passive sign convention.	Marks 3 PLO1

			
Q2.	(a)	Refer to the circuits 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 branches 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  	Marks 4 PLO2
	(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 100 μA. Determine I_C and I_E	Marks 6 PLO2

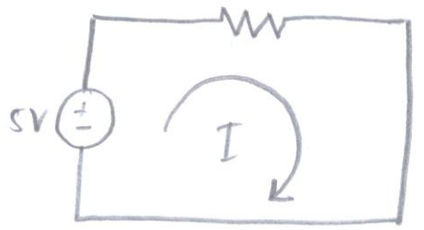
			
Q3 .	(a)	Although drawn so that it may not appear obvious at first glance, the circuit of following figure is in fact a single-node-pair circuit. a. Determine the power absorbed by each resistor. b. Determine the power supplied by each current source. c. Show that the sum of the absorbed power calculated in (a) is equal to the sum of the supplied power calculated in (b). 	Marks 5 PLO1
	(b)	Determine the power absorbed by the 15 Ω resistor in the circuit of following figure 	Marks 5 PLO1

Question #01

Part (a)

for each of the circuit in figure, find the current I and compute the power absorbed by the resistance or?

i)



apply ohm law

$V = IR$

$I = V/R$

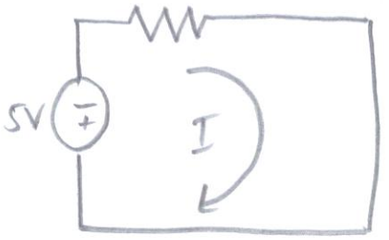
$I = 5/10K\Omega \Rightarrow \boxed{I = 0.5mA}$

$P = VI$

$(5)(0.5mA) = 2.5 \times 10^{-3} w$

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

ii)



Apply ohm law

$I = V/R$

$I = -5/10K\Omega$

⇒ $-0.5mA$

Power, $P = VI$

$P = (-5)(-0.5mA)$

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

iii)

Apply ohm law

$I = V/R$

$I = -5/10K\Omega$

$= 0.5mA$

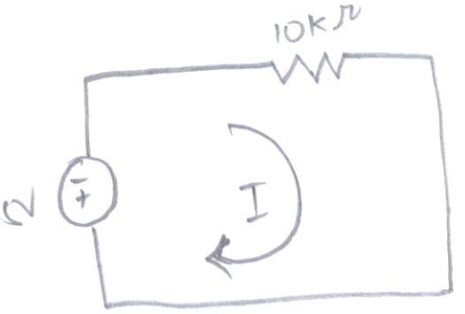
Power,

$P = VI$

$P = (-5)(0.5mA)$

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

iv)



Apply ohm law

$I = V/R$

$I = 5/10k\Omega$

$\boxed{I = 0.5mA}$

$P = V/I$

$P = (-5)(0.5mA)$

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

Part (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 accordance with the passive sign convention.

i) Ohm law

$R = V/I$

$R = 2/0.02$

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

ii) $R = V/I$

$R = 5/0$

$\boxed{R = \infty}$

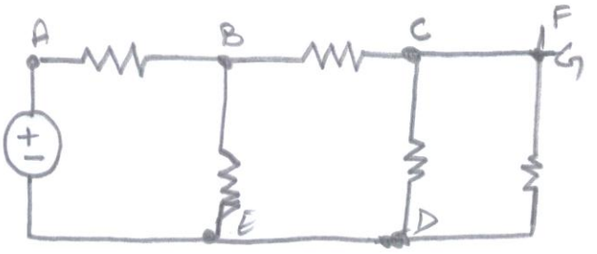
iii) $R = V/I$

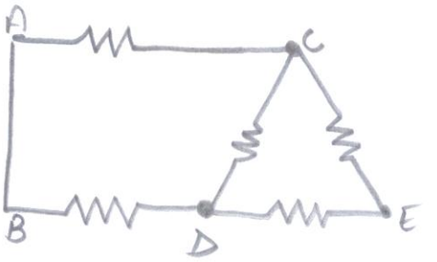
$= 0/0.03$

$R = 0\ \Omega$

Question #02

(Part a)





1) How many nodes are ~~content~~ Contained in the circuit?

⇒ In first circuit there are six nodes.

⇒ In second circuit there are four nodes.

2) How many elements in a circuit?

⇒ In first circuit there are six elements.

⇒ In second circuit there are five elements.

3) How many branches?

⇒ In first circuit there are six branches.

⇒ In second circuit there are five branches.

4) Path or loop?

i) From A to B

Its a path.

ii) B to D to C to E

Its a path.

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

Its a loop

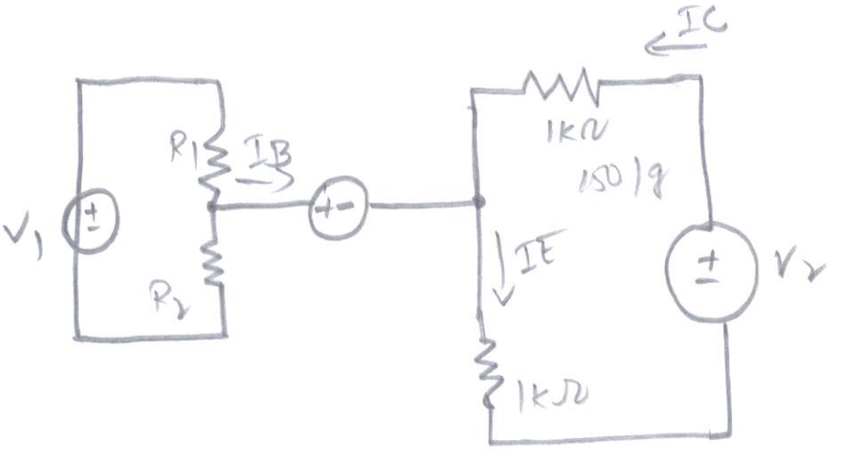
iv) C to D to B to A to C to E

Its a loop

Question #04

(Part B)

for the circuit of following figure (which is a model for dc operation of a bipolar junction transistor biased in forward active region) I_B is measured to be 100μA. Determine I_C and I_E.



KCL state that the total intering a node must equal to total current leaving the node.

$$I_B + I_C = I_E$$

As we know that

$$I_C = 150 \cdot I_B$$

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

Now we can calculate I_E

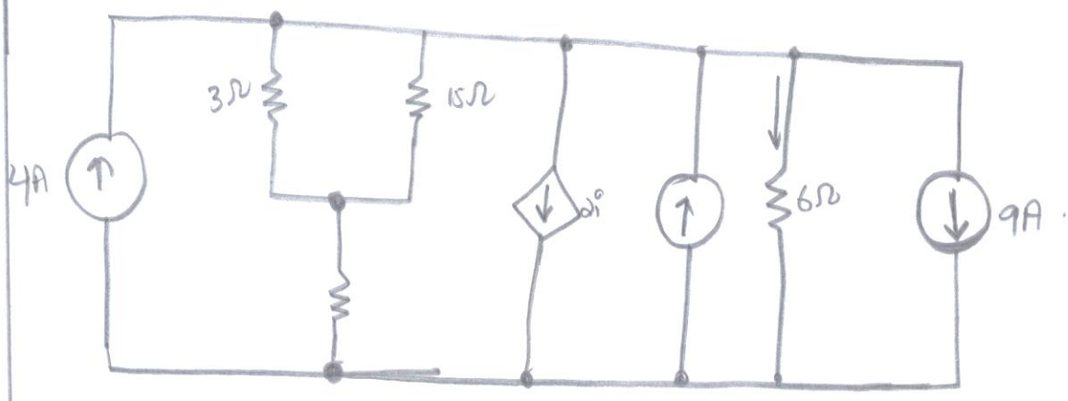
$$I_E = 15 \cdot 10^{-3} + 100 \cdot 10^{-6}$$

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

Question #03

Part B :-

Determine the power absorbed by the 15Ω resistor in the corrent of following figures:-



Solution:-

Now combine the set of resister.

$6+3\|15 = 8.5\Omega$

The independent source may be combine to a sinpel

$4+3-9 = -2A$ source

Apply KCL,

$\Rightarrow \quad -2-2I = V/8.5 + V/6 + V/6 \quad (eq.1)$

$\Rightarrow \quad$ where $I = V/6$

Thus eq no: 1

$-2-2V/6 = V/8.5 + 2V/6$ or $V = -19V$

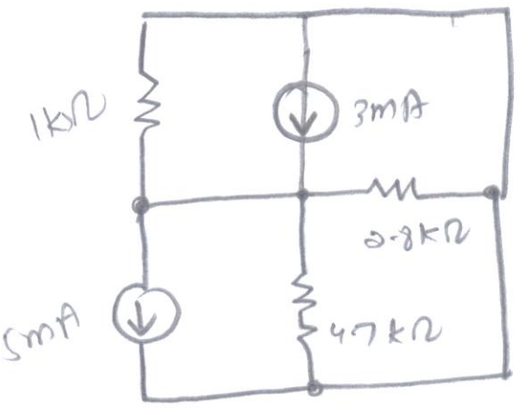
A current $19/8.5 = -2.235A$ flow downward to the combination.

The volteye across in the $3\Omega \| 15\Omega$ combination is

$V = 6(-2.235) = -5.59V$

Thus, $P_{15\Omega} = (-5.59)2/15 =$ **2.083W**.

(Part A):-



Answer :-

Kcl yield $3\times10^{-3} - 5\times10^{-3} = V/1000 + V/4700 + V/2800$

Solving $V_z = -1.074V$

a)

R	Pabsorbed
1kΩ	1.623mW
4.7kΩ	345.3μW
2.8kΩ	579.7μW

b)

source	Pabsorbed
3mA	$(V)(3\times10^{-3}) = -3.833mW$
5mA	$(V)(-5\times10^{-3}) = +6.370mW$

c) $\sum P_{absorbed} = 2.548mW$

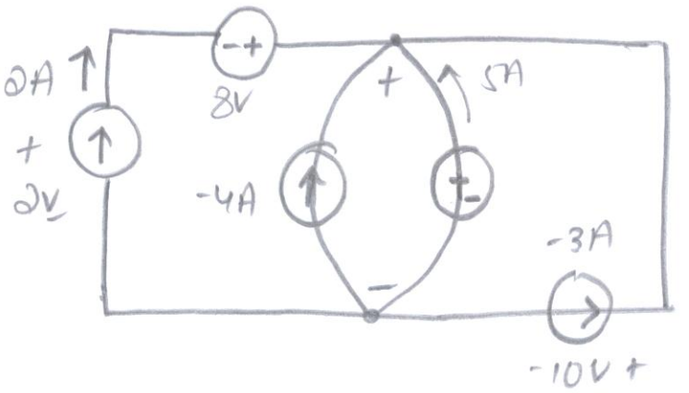
$\sum P_{supplied} = 2.548mW$

Thus, $\sum P_{supplied} = \sum P_{absobed}$

Question #01

Part : B

Determine the power supplied by the leftmost element in the circuit of following figure.



$P_{V1} = I_1 V_1 = (2) \times (2) = 4W$

$P_{V2} = I_1 V_2 = (2) \times (8V) = 16W$

$P_{V3} = I_2 V_3 = (-4)(10V) = -40W$

$P_{V4} = I_3 V_3 = 10 \times 5 = 50W$

$P_{V5} = I_4 V_4 = (-3)(10) = -30W$