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

Course Details

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

Student Details

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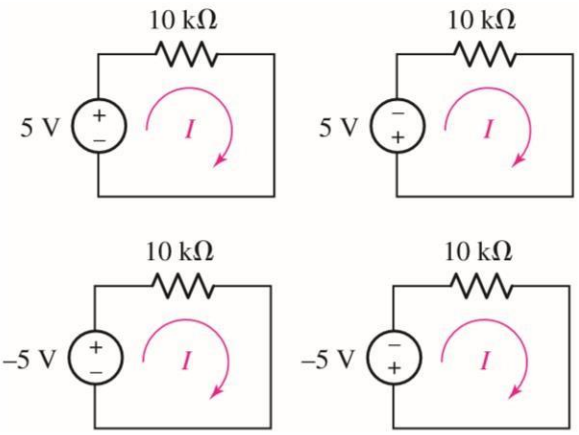
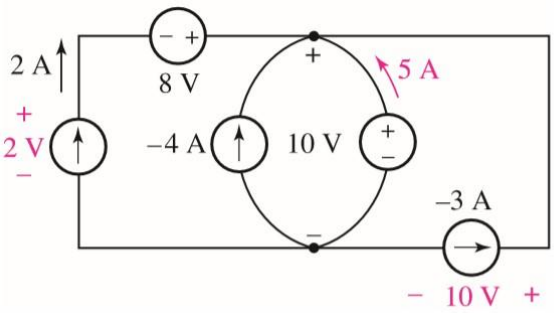
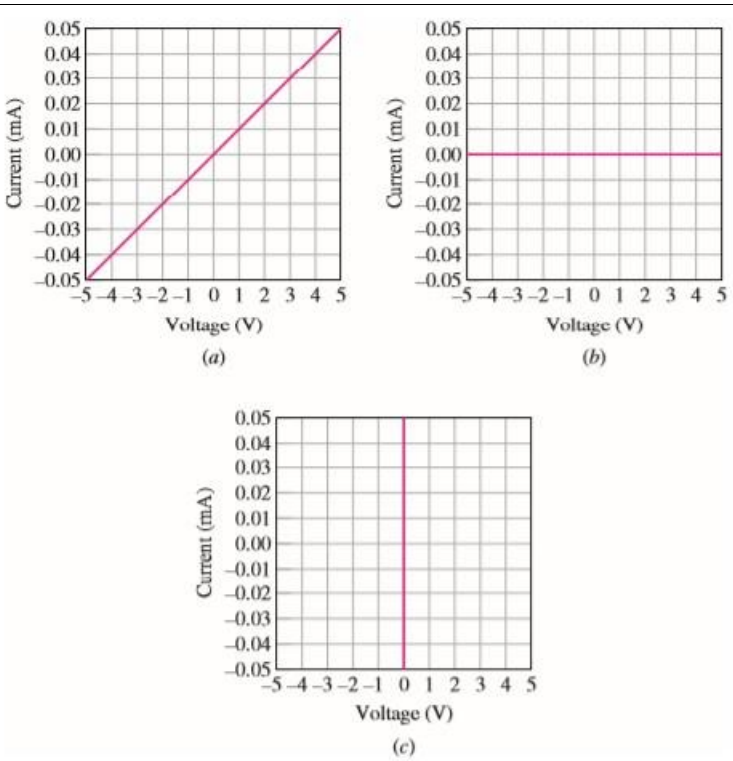
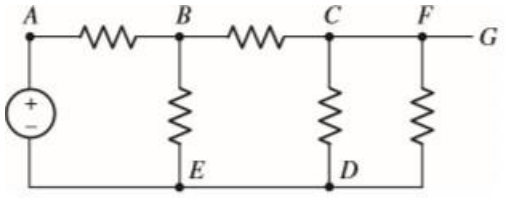
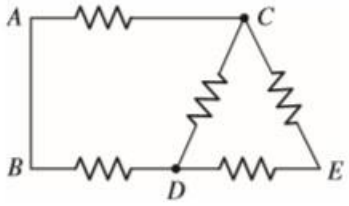
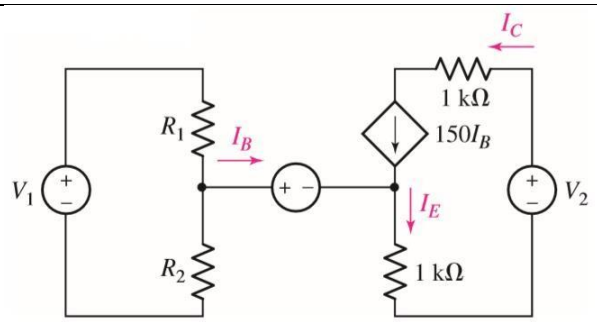
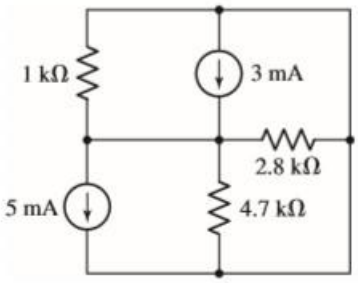
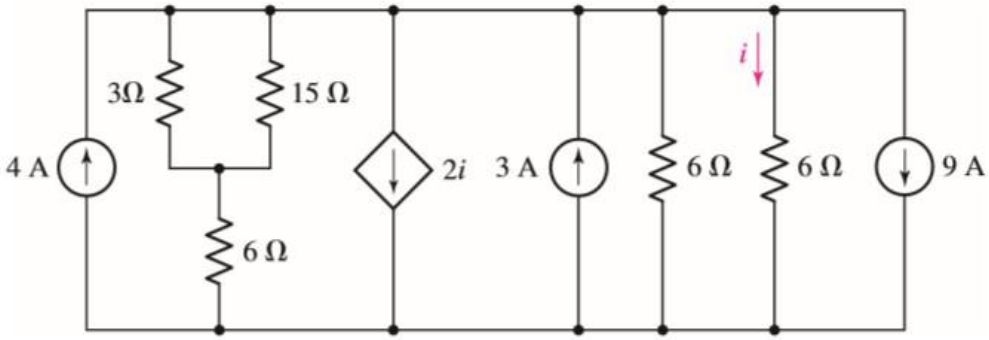
Student ID: 16431 **SEMESTER:2ND**

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)		Marks 4

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

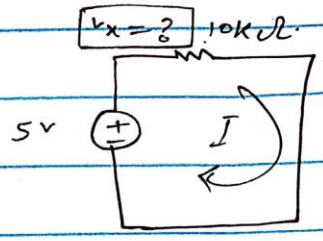
			
Q2.	(a)	Refer to the circuits of following figures, and answer the following: 1. How many distinct nodes are contained in the circuit?	Marks 4

		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  	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□ resistor in the circuit of following figure	Marks 5

			PLO1

Q NO. 01 (Ans) (a)

Circuit (a)



find current and Power absorbed by resistor.

Ans :- To find current and Power, we use KVL Rule,

$$(-5) + V_x = 0$$

$$\boxed{V_x = 5\ V}$$

$$I = \frac{V}{R} = \frac{5}{10 \times 10000}$$

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

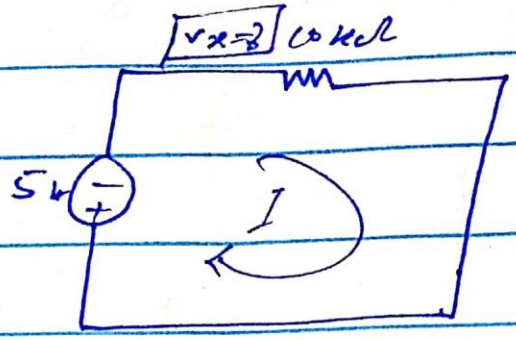
$$P = VI$$

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

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

Q NO. 01 (Ans.)

Circuit (b)



~~Ans:~~ Find current and power absorbed by resistor.

Ans. To find current and power, we use KVL Rule,

$$5 + v_x = 0$$

$$\boxed{v_x = -5V}$$

To find current

$$I = \frac{V}{R} = \frac{-5}{10 \times 1000}$$

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

To find power.

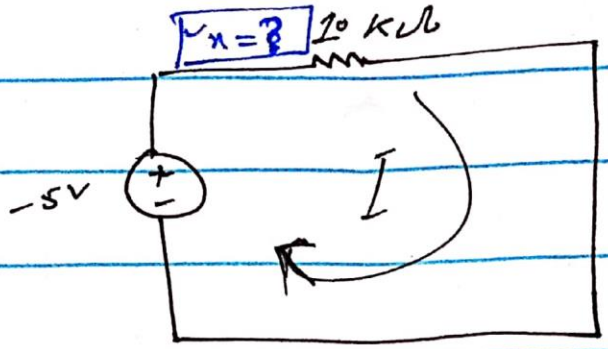
$$P = VI$$

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

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

Q No. 01 (Ans)

(c) Circuit 3



To find current and power:-

Ans.

To find current and power, we use KVL Rule,

$$-(-5v) + V_x = 0$$

$$\boxed{V_x = 5V}$$

To find current

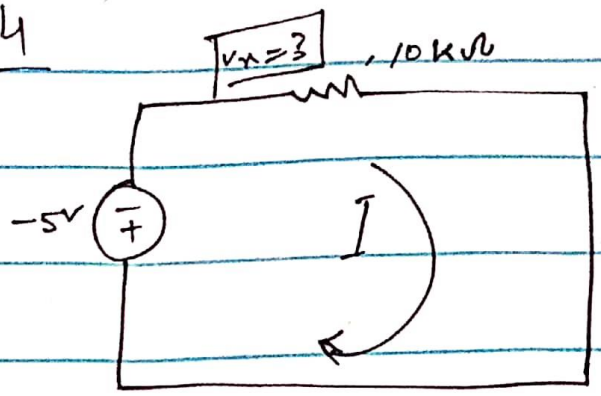
$$I = \frac{V}{R} = \frac{5}{10 \times 1000}$$

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

To find power:-

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

Circuit 4



TB find Current and Power?

Ans.

To find current and power, we use KVL Rule,

$$(-5\,V) + V_x = 0$$

$$\boxed{V_x = 5\,V}$$

To find current

$$I = \frac{V}{R} = \frac{5}{10 \times 1000}$$

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

To find Power.

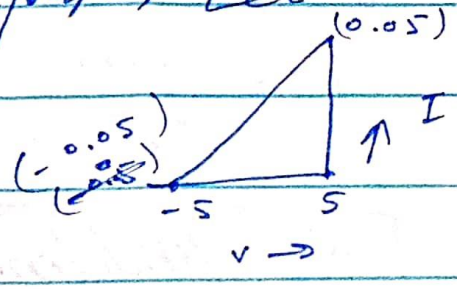
$$P = VI$$

Q NO. 1 (C)

Ans.

1st Graph:-

By using graph, Let



$$\Delta I = 0.05 + 0.05$$

$$\boxed{\Delta I = 0.1\,A}$$

$$\Delta V = 5 + 5$$

$$\boxed{\Delta V = 10\,V}$$

$$R = ?$$

$$R = \frac{\Delta V}{\Delta I} = \frac{10}{0.1} = 100$$

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

2nd Graph:-

By using graph, we see That

$$\Delta I = 0$$

$$\Delta V = 10V$$

$$R = \frac{10}{0}$$

$$\boxed{R = \text{undefined.}}$$

3rd Graph:-

By using graph, we see That

$$\Delta V = 0$$

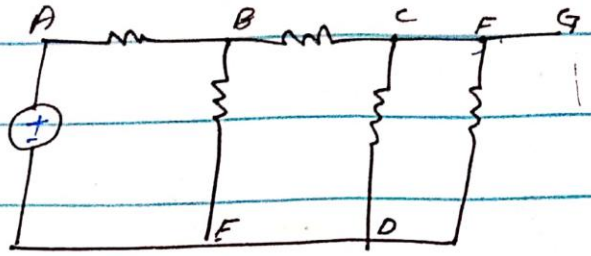
$$\Delta I = 0.1$$

$$R = \frac{\Delta V}{\Delta I} = \frac{0}{0.1}$$

$$\boxed{R = 0\,\Omega}$$ constant

~~$R = 0\,\Omega$~~ 0ohm

Q No 10.2 (a)



In This Circuit

(1) Nodes: 4 Nodes

(2) Elements: 6 Elements

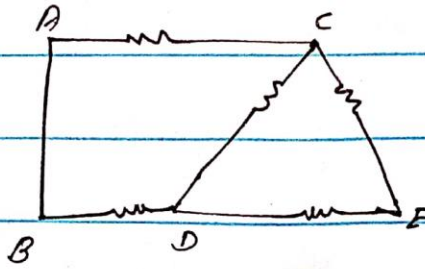
(3) branches: 10 branches.

(4) (i) A To b = Path

B To D to C to E = Path

C to E To D To B To A To C = loop and path

C To D To B To A To C To E = Loop and Path.



In this circuit

(1) Nodes = 4 Nodes

(2) Elements = 5 Elements

(3) Branches = 9 Branches.

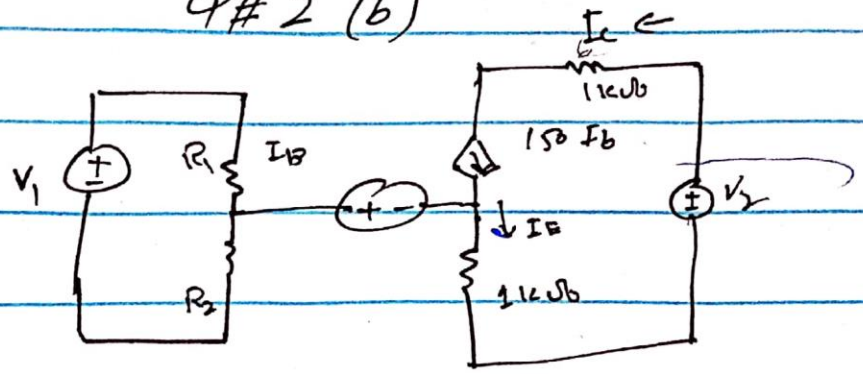
(4) (i) A To b = Path

(ii) B to D to C to E = Path

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

(iv) C to D to B to A to C to E = Loop Path

Q# 2 (b)



Ans: I_C is a collector current and I_B is a base current.

So

$I_B = 100\mu A$. $I_C = ?$

$I_C = 150 I_B$ $I_E = ?$

$I_C = I_E + I_B$

$150 I_B = I_E + I_B$

$149 I_B = I_E$

$149 \times 100\mu = I_E$

$$14900\mu A = I_E$$

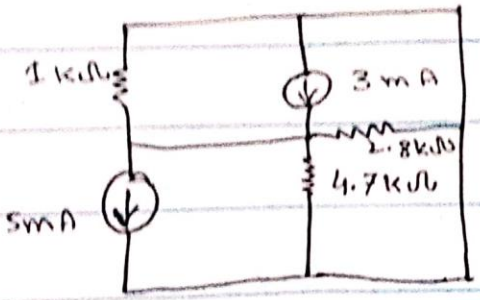
$I_C = 150 I_B$

$I_C = 150 \times 100\mu$

$$I_C = 15{,}000\mu A$$

Date: / /

Q3 (a) (Ans)



(a) By This circuit diagram we find power.

$P_1 = I^2 R$

$P_1 = (5)^2 (1000)$

$\boxed{P_1 = 25 \times 10^3 W}$

$P_2 = (5)^2 (4.7k)$

$P_2 = (25)(4.7 \times 1000)$

$\boxed{P_2 = 117.5 kW}$

$P_3 = (3)^2 \times 2.8 \times 1000$

$\boxed{P_3 = 25.2 kW}$

Total Power $= P_T = P_1 + P_2 + P_3 = 167.7 KW$

$= 25$

$\boxed{P_T = 167.7 KW}$

(b) $V_1 = I_1 R_1$

$\boxed{V_1 = 5kV}$

$V_2 = I_2 R_2 = 4.7k \times 5$

$\boxed{V_2 = 23.5kV}$

$V_3 = 3 \times 2.8k$

$\boxed{V_3 = 8.4kV}$

$P_1 = V_1 I_1$

$P = (5k)(5)$

$\boxed{P_1 = 25 \times 10^3 W}$

$P_2 = V_2 I_2 =$

$= 23.5k \times 5 = 117.5kW$

$\boxed{P_2 = 117.5kW}$

$P_3 = V_3 I_3$

$= 8.4k \times 3$

$\boxed{P_3 = 25.2 \times 10^3 W}$

Q NO. 3 (b)

Solution. Find power.

By using circuit diagram.

Let R_1 and R_2 are in parrallel

so

$$\frac{1}{Re} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{Re} = \frac{1}{3} + \frac{1}{15} = \frac{5+1}{15} = \frac{2}{5}$$

$$\boxed{Re = \frac{5}{2}\ \Omega}$$

Let $\boxed{Re = R_1}$ ~~$R_2 = 6\ \Omega$~~

Now $Re = R_1 + R_2$

$$Re = \frac{5}{2} + 6$$

$$Re = \frac{5+12}{2} = \frac{17}{2}$$

$$\boxed{Re = \frac{17}{2}\ \Omega}$$

$$V = I\,Re = 4 \times \frac{17}{2}$$

$$\boxed{V = 34\,V}$$

for 15 ohm resistor

$V_1 = I_1 R_1$

$34 = I_2 \times 15$

$\frac{34}{15} = I_2$

$\boxed{I_2 = 2.26\,A}$

$P = I^2 R$

$P = (2.26)^2 \times (15)$

$\boxed{P = 76.61\,W}$