CSE 250 : Circuits and Electronics

Experiment 02

Introduction to series and parallel circuits

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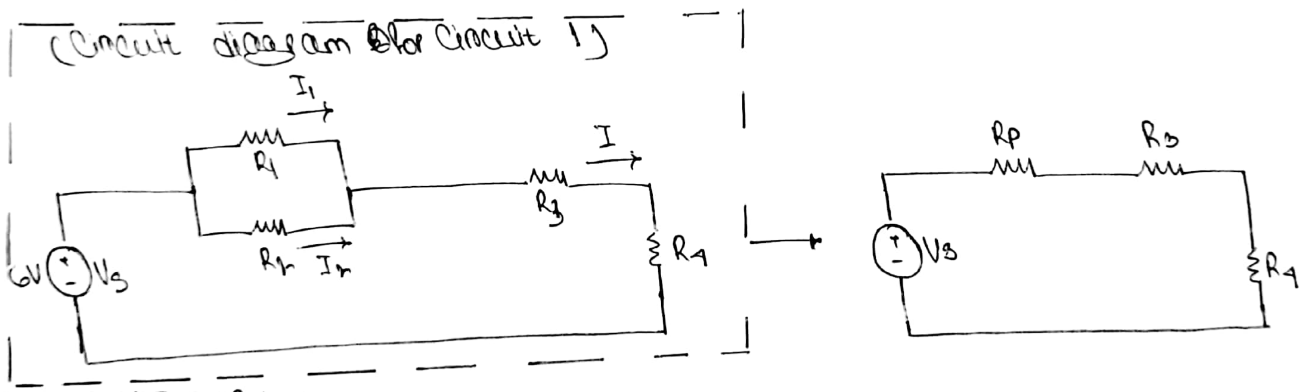
Section : 06
Group: 01
Semester: Fall'22
Date of performance: 16/10/2022
Date of submission: 23/10/2022

▣ REPORT

▣ Result Table for Circuit 1

R_1 (KΩ)	R_2 (KΩ)	R_3 (KΩ)	R_4 (KΩ)		R_{eq} (KΩ)	I_1 (mA)	I_2 (mA)	$V_{3,4}$ (V)	I (mA)	$I = I_1 + I_2$ (mA)
0.98	0.98	0.98	0.98	Experimental	2.46	1.2	1.19	4.7	2.398	2.39
				Theoretical	2.45	1.22	1.22	4.8	2.449	2.44

(Circuit diagram for Circuit 1)



CALCULATIONS:-

$$R_p = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1} = \left(\frac{1}{0.98} + \frac{1}{0.98}\right)^{-1} = 0.49\ K\Omega$$

$$R_{eq} = R_p + R_3 + R_4 = 0.49 + 0.98 + 0.98 = 2.45\ K\Omega$$

$$I = \frac{V_s}{R_{eq}} \Rightarrow I = \frac{6}{2.45} = 2.449\ mA$$

$$I_1 = \frac{R_p}{R_1} \times I \Rightarrow \frac{0.49}{0.98} \times 2.449 = 1.22\ mA$$

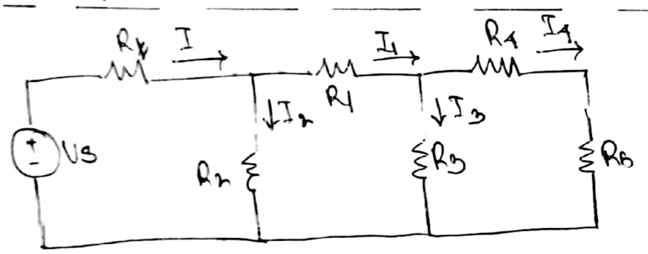
$$I_2 = \frac{R_p}{R_2} \times I \Rightarrow \frac{0.49}{0.98} \times 2.449 = 1.22\ mA$$

$$V_{3,4} = \frac{R_3 + R_4}{R_{eq}} \times V \Rightarrow \frac{0.98 + 0.98}{2.45} \times 6 = 4.8V$$

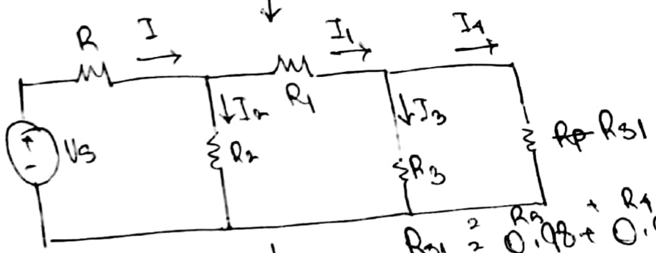
Result Table for Circuit 2

R (kΩ)	R_1 (kΩ)	R_2 (kΩ)	R_3 (kΩ)	R_4 (kΩ)	R_5 (kΩ)	Observation	I_1 (mA)	I_2 (mA)	I_3 (mA)	I_4 (mA)	$I_1 = I_3 + I_4$ (mA)	I_b = (mA)	$I = I_1 + I_2$ (mA)	R_{eq} (kΩ)
0.98	0.98	0.98	0.98	0.98	0.98	Experimental	~~1.60~~ 1.38	2.31	0.92	0.45	1.37	3.68	3.69	1.60
						Theoritical	~~1.88~~ 1.267	~~1.88~~ 2.50	~~0.94~~ 0.847	~~0.94~~ ~~0.417~~ 0.422	~~1.88~~ 1.27	3.77	~~3.76~~ 3.77	1.59

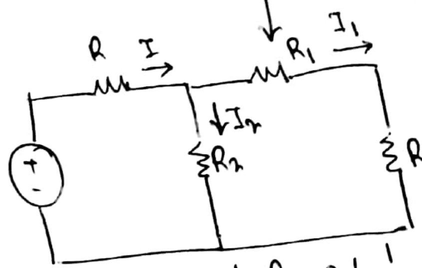
Calculations:-



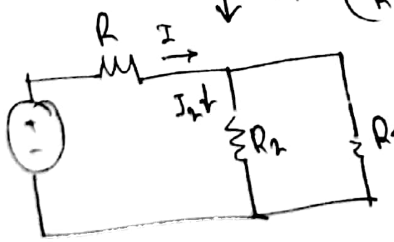
(Circuit diagram for Circuit 2)



$R_{31} = R_5 + R_4 = 0.98 + 0.98 = 1.96\,k\Omega$



$R_{p1} = \left(\frac{1}{R_{31}} + \frac{1}{R_2}\right)^{-1} = \left(\frac{1}{1.96} + \frac{1}{0.98}\right)^{-1} = 0.653\,k\Omega$



$R_{32} = R_1 + R_{p1}$

$= 0.98 + 0.653$

$= 1.63\,k\Omega$

$R_{p2} = \left(\frac{1}{R_{31}} + \frac{1}{R_2}\right)^{-1}$

$= \left(\frac{1}{1.63} + \frac{1}{0.98}\right)^{-1}$

$= 0.6125\,k\Omega$

$R_{eq} = R_{p2} + R$

$= 0.6125 + 0.98$

$R_{eq} = 1.59\,k\Omega$

$I = \frac{V_s}{R_{eq}} \Rightarrow I = \frac{6}{1.59} = 3.77\ mA$

$I_1 = \frac{\left(\frac{1}{R_2+R_4} + \frac{1}{R_3}\right)^{-1}}{R_2+R_1} \times I \Rightarrow I_1 = \frac{\left(\frac{1}{0.98} + \frac{1}{0.98}\right)^{-1} + \frac{1}{0.98}\Big)^{-1}}{0.98} \times 3.77 = \cancel{1.88\ mA}\ 1.27\ mA$

$I_2 = I - I_1 \Rightarrow I_2 = 3.77 - \overset{1.27}{\cancel{1.88}} = \cancel{1.88\ mA}\ 2.50\ mA$

$I_4 = \frac{\left(\frac{1}{R_1 + R_4} + \frac{1}{R_3}\right)^{-1}}{R_4} \times I_2 \quad \frac{\left(\frac{1}{0.98} + \frac{1}{0.98} + \frac{1}{0.98}\right)^{-1}}{0.98} \times \underset{1.267}{\cancel{1.88}} = \cancel{0.94\ mA}\ 0.423\ mA$

$I_3 = I_1 - I_4 = \cancel{1.88 - 0.94 = 0.94\ mA}$

$\cancel{= 1.26 - 0.417\ 0.423 =}$

$= 1.27 - 0.423 = 0.847\ mA$

7) Comment on the obtained results and discrepancies (if any)

For circuit 1: The difference between the experimentally obtained results and theoritically obtained results are very close enough. Thus, showing almost no significant change in values between the experimental values and theoritical values.

For circuit 2: There is almost no ~~also~~ significant difference between the experimentally obtained values and theoritically obtained values ~~of I_1, I_2, I_3, I_4 and almost no difference betw between~~ for the ~~values of I_3, Req and I. The~~ The slight ~~diff~~ significant differences may have occured due to ~~get~~ fluctuations of readings on the multimeter while taking the readings. Also, the DC power supply was supposed to provide 6V voltage. But, there was a fluctuations in the power supply as well. ~~There may be an~~

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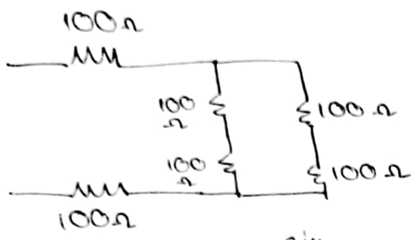
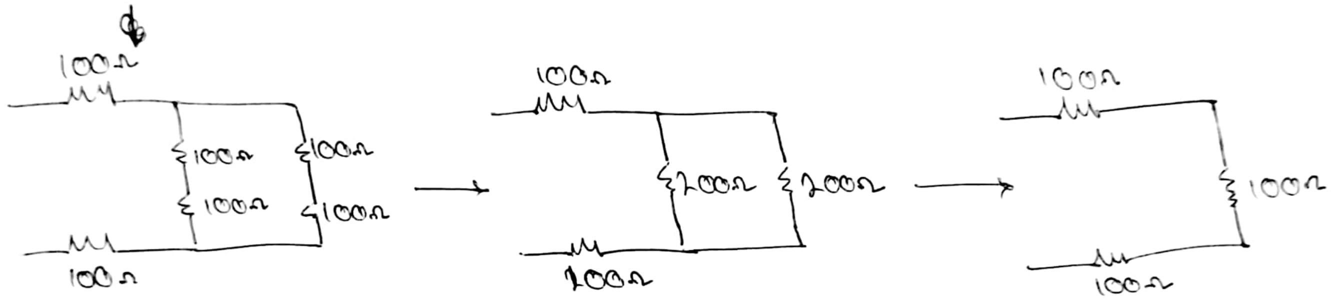
Question

(1)

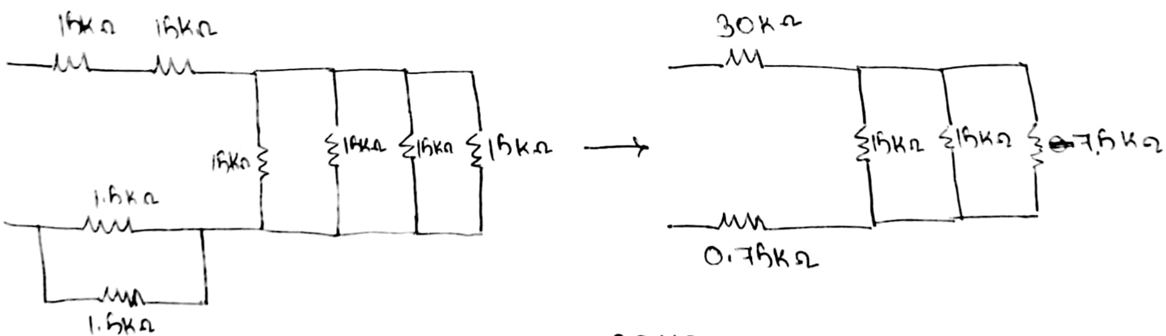


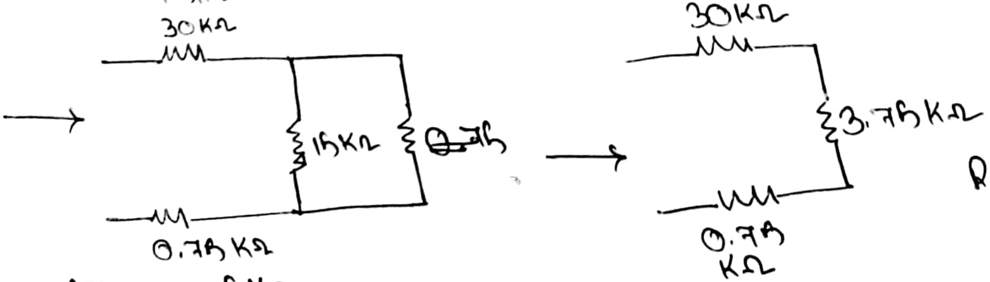
(Arrangement of six 100 Ω resistors to provide 300 Ω resistance)



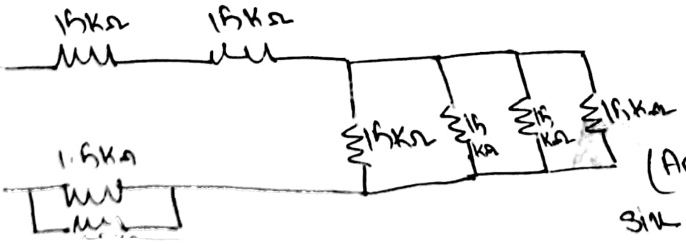
$R_{eq} = 100 + 100 + 100 = 300\,\Omega$

(2)





$R_{eq} = 30 + 0.75 + 3.75$
$= 34.5\ k\Omega$



(Arrangement of two 1.5 kΩ & six 15 kΩ resistors to provide 34.5 kΩ resistance)

Discussion

Both the circuits (circuit 1 and circuit 2) were connected on the trainer board ~~using DC po~~ using the circuit diagram ~~from the~~ without thinking about any parallel or series ~~w~~ connection to avoid confusion during the process.

Voltage was measured for all the voltages asked in the data table; ~~usi~~ by connecting multimeter across the nodes of the resistors and setting the multimeter ~~at volt~~ to measure voltage using the knob. Also, resistors were connected on the trainer board before building up the circuit and using the multimeter across both ends, resistance is measured.

Since we had the necessary voltages and resistances, we calculated current using Ohm's law. ~~Using multimeter~~ To measure current, the multimeter needs to be connected in series with the resistors; leading to opening up the circuit. Thus, gives inaccurate current values. So, ~~it is not~~ there is no need to measure current directly.

BRAC UNIVERSITY
DEPT. OF COMPUTER SCIENCE AND ENGINEERING
COURSE NO.: CSE250
Circuits and Electronics Laboratory

Experiment No. 2

Name of the Experiment: Introduction to series and parallel circuits.

Group No.: 01

Signature of lab faculty: [illegible]

Date: 16-10-2023

Table 1: For circuit 1

Observation	Experimental	Theoretical
$R_{eq}(K\Omega)$	~~1.1704~~ 2.46	2.45

Table 2: For circuit 1

R_1 (kΩ)	R_2 (kΩ)	R_3 (kΩ)	R_4 (kΩ)	Observation	$I_1=V_{R1}/R_1$ (mA)	$I_2=V_{R2}/R_2$ (mA)	$V_{3,4}$ (V)	$I=\frac{V3,4}{R3+R4}$ (mA)	$I=I_1+I_2$ (mA)
0.98	0.98	0.98	0.98	Experimental	$I_1=\frac{1.176}{0.98}=1.2$	$I_2=\frac{1.17}{0.98}=1.19$	4.7	$I=\frac{4.7}{0.98+0.98}=2.398$	$I=1.2+1.19=2.39$
				Theoretical	$\cancel{I_1=\frac{0.98}{2.45}\times 6}$ $I_1=1.2$	$I_2=1.2$	4.8	2.449	2.4

Table 3: For circuit 2

Observation	Experimental	Theoretical
R_{eq}(KΩ)	1.60	1.599

Table 4: For circuit 2

R (kΩ)	R_1 (kΩ)	R_2 (kΩ)	R_3 (kΩ)	R_4 (kΩ)	R_5 (kΩ)	Observation	$I_1=V_{R1}/R_1$ (mA)	$I_2=V_{R2}/R_2$ (mA)	$I_3=V_{R3}/R_3$ (mA)	$I_4=V_{R4}/R_4$ (mA)	$I_1=I_3+I_4$ (mA)	$I=V_R/R$ (mA)	$I=I_1+I_2$ (mA)
0.98	0.98	0.98	0.98	0.98	0.98	Experimental	$\frac{1.35}{0.98}$ = 1.38	$\frac{2.26}{0.98}$ = 2.31	$\frac{0.9}{0.98}$ = 0.92	$\frac{0.44}{0.98}$ = 0.45	0.92 + 0.45 = 1.37	$\frac{3.61}{0.98}$ = 3.68	1.38 + 2.31 = 3.69
						Theoretical	~~1.88~~ 1.27	~~1.88~~ 2.50	~~0.94~~ 0.847	~~0.94~~ 0.423	~~[illegible]~~ 1.27	~~0.3~~ 3.78	3.59

Table 5: For lab task

R_1 (kΩ)	R_2 (kΩ)	R_3 (kΩ)	R_4 (kΩ)	Observation	$I_1=V_{R1}/R_1$ (mA)	$I_2=V_{R2}/R_2$ (mA)	I1=VR1/1 (mA)	$I_3=V_{R3}/R_3$ (mA)	$I_4=V_{R4}/R_4$ (mA)
				Experimental					
				Theoretical					