



Course Name:	Elements of Electrical and Electronics Engineering	Semester:	I
Date of Performance:	1,5 / 11 / 2022	Batch No:	C2-2
Faculty Name:	Jyoti Varavedkar	Roll No:	1601012210 9
Faculty Sign & Date:		Grade/Marks:	/ 25

Experiment No: 2

Title: Battery Voltage level Indicator.

Aim and Objective of the Experiment:

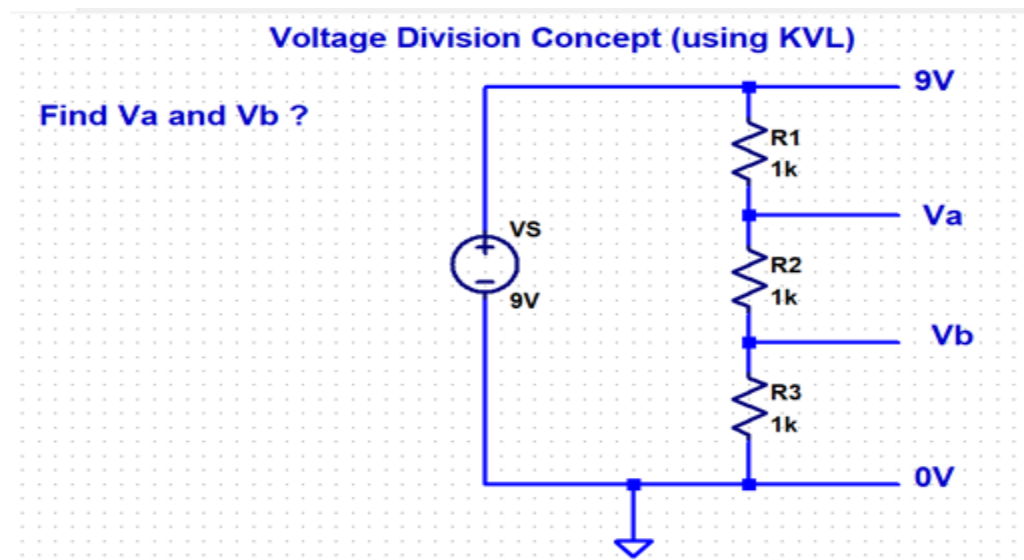
- To understand voltage division concept, current division concept and principle of operation of LED.
- To develop a micro project (Battery level indicator) based on the concepts learned in the form of various task performed in the experiment.

COs to be achieved:

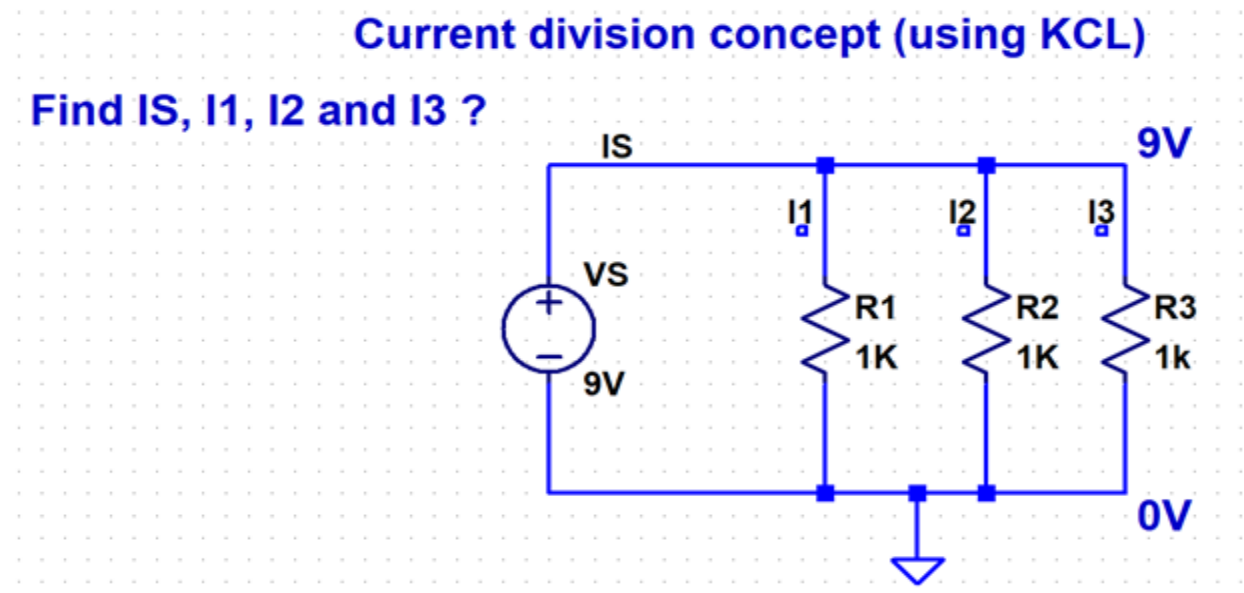
CO1: Analyze resistive networks excited by DC sources using various network theorems.

Circuit Diagram/ Block Diagram:

Task 1: Voltage division Concept and its verification on breadboard

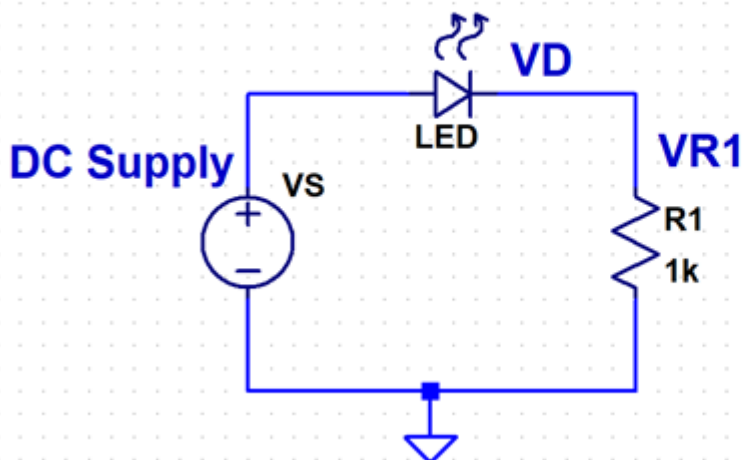


Task 2: Current division Concept



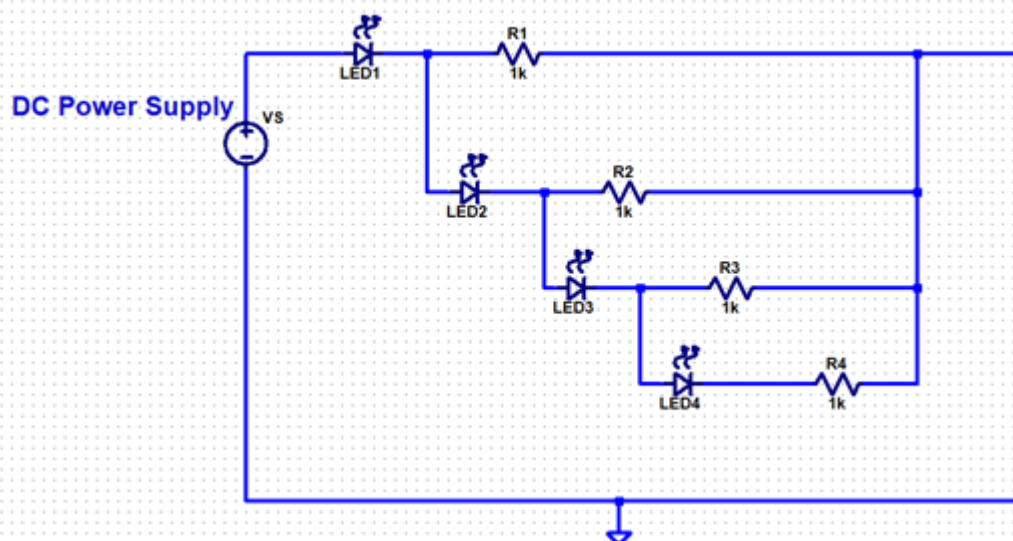
3: Turn on an LED and measure its turn-on voltage

Turning on an LED and concept of current limiting resistor



Task 4: Battery Level Indicator Circuit

Battery Level Indicator Circuit diagram



Stepwise-Procedure:

1. Make the connections as shown in the circuit diagram for Task1. Measure the voltages V_a , V_b

and current I_s for Task 1 and compare with calculated results.

2. Make the connections as shown in the circuit diagram for Task2. Measure the currents I_1, I_2, I_3 and I_s and compare with calculated results.
3. Make the connections as shown in the circuit diagram for Task3. Measure the voltages V_s, V_D, V_{R1} for Case1 and Case 2.
4. Make the connections as shown in the circuit diagram for Task4. Measure the voltages across LED and resistors.

Observation Table:

Observation Table 1 (Task 1)

Voltages / Currents	Theoretical reading	Practical reading
V_a	6 V	6.01 V
V_b	3 V	3 V
I_s	3 mA	3.01 mA

Calculations (Task1):

Calculate V_a and V_b using the formula given below:

$$V_a = \frac{(R_2 + R_3) * V_s}{R_1 + R_2 + R_3}$$

$$V_b = \frac{(R_3) * V_s}{R_1 + R_2 + R_3}$$

Observation Table 2

Currents	Theoretical reading (I mA)	Practical Reading (I mA)
I1	9	9.01
I2	9	9.02
I3	9	9.02
IS	27	27.2

Calculations (Task2):

Calculate I1, I2, I3 and IS using the formula given below:

$$I1 = \frac{VS}{R1}$$

$$I2 = \frac{VS}{R2}$$

$$I3 = \frac{VS}{R3}$$

$$IS = I1 + I2 + I3$$

Observation (Task 3):
Case 1 : LED just turn's ON

Parameters	Practical reading
VS	2.2
VD	2.12
VR1	0.04

Case 2 : LED turn's ON (glows brightly)

Parameters	Practical reading
VS	3.0
VD	2.3
VR1	0.68

Observations (Task4):
Case 1 : Supply Voltage Levels recording

Scenario	DC Supply voltage (VS) reading Just glow	DC Supply voltage (VS) reading Glows brightly
LED 1 ON	1.7	3.8
LED 1 ON & LED 2 ON	3.8	6.4
LED 1 ON & LED 2 ON & LED 3 ON	6.4	7.6
ALL LEDs ON	7.6	12.5

$V_s = 12.5 \text{ V}$

2: Status of voltages in the circuit



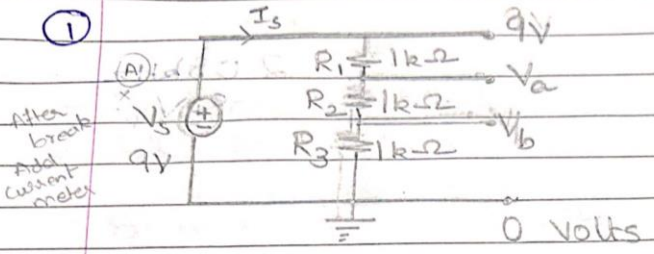
Voltages	Practical reading (in Volts)
V_{LED 1}	2
V_{LED 2}	1.9
V_{LED 3}	1.9
V_{LED 4}	1.8
VR1	10.4
VR2	8.4
VR3	6.5
VR4	4.6

Screenshot of Output:

Battery level Indicator

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After break Add current meter



Calculations :

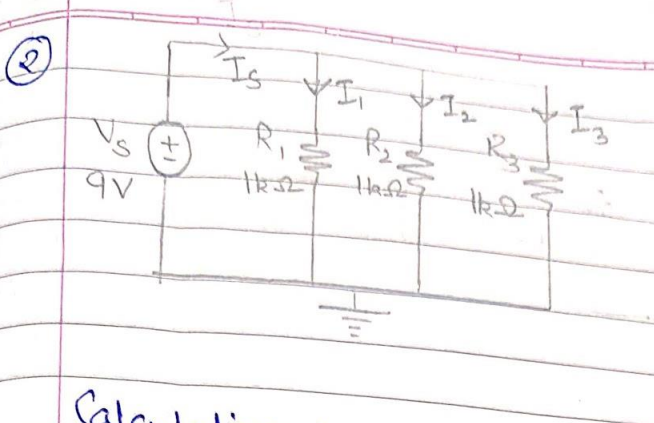
$$V_a = \frac{(R_2 + R_3) \times V_s}{R_1 + R_2 + R_3}$$

$$V_b = \frac{R_3 \times V_s}{R_1 + R_2 + R_3}$$

Observation Table:

Voltage (Volts) or Current	Theoretical calculations	Practical calculations V / (mA)
V_a	6	6.01 V
V_b	3	3.01 V
I_s	3	3.01 (mA)

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Calculations :

$$I_1 = \frac{V_s}{R_1}$$

$$I_2 = \frac{V_s}{R_2}$$

$$I_3 = \frac{V_s}{R_3}$$

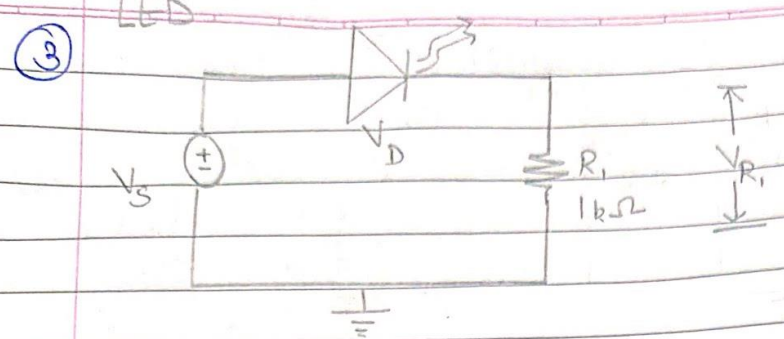
$$I_s = I_1 + I_2 + I_3$$

Observation Table:

Currents	Theoretical calculations (mA)	Practical calculations (mA)
I_1	9	9.02
I_2	9	9.02
I_3	9	9.02
I_s	27	27.2

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LED



Observations:

Case 1: LED just turns ON

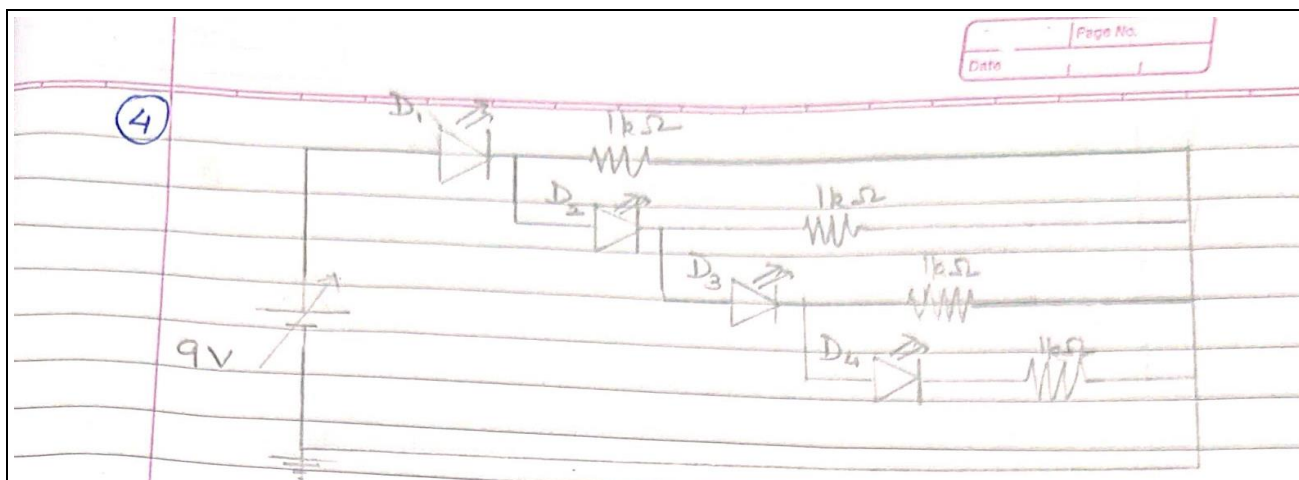
Parameter	Practical Reading (V)
V_s	2.2
V_D	2.12
V_{R_1}	0.041

Case 2: LED ON (glows brightly)

Parameter	Practical Reading (V)
V_s	3.0
V_D	2.3
V_{R_1}	0.68

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(4)



Scenario	DC supply voltage (Vs) reading	
LED 1 ON	just glow 1.7	3.8 glows brightly
LED 2 ON & LED 2 ON	3.8	6.4
LED 1 ON, LED 2 ON & LED 3 ON	6.4	7.6
ALL LEDs ON	7.6	12.5

$V_s = 12.5$

Voltages	Practical reading (in volts)
$V_{LED 1}$	1.2
$V_{LED 2}$	1.9
$V_{LED 3}$	1.9
$V_{LED 4}$	1.8
VR1	10.4
VR2	8.4
VR3	6.5
VR4	4.6

Post Lab Subjective/Objective type Questions:

1. Mention some applications of battery level indicator.

Battery level indicator helps us to know the battery status of that particular device.

Applications of battery level indicator are:

- It is shown in mobile phones in the form of dot or bar and helps us to recognise the battery level easily.
- It can present a circuit that can know the battery level of a device from the number of LED glowing and display on LCD.

2. Explain practical usage of Voltage- division concept?

Principle of Voltage division rule states that the total voltage applied across a series connection of multiple resistors is divided among the resistors in proportional to their resistances. This means voltage drop will be maximum across the resistor having maximum value of resistances. Voltage dividers are used for adjusting the level of signal, for bias of active devices in amplifiers and for measurement of voltages. Voltage divider rule is applicable to all series and combination resistors.

3. Explain working of Battery Level Indicator implemented in this experiment in your own words?

Battery level indicator helps us to know the status of battery of the device just by glowing the number of LEDs. Battery level indicator is a device which gives us information about the battery. The battery level indicator is shown in dot or bar form in mobiles phones and computers.

Conclusion:



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Department of Sciences and Humanities



We learned the concept of current divider rule and voltage divider rule. We learned the principle to operate LEDs..We learnt the status of battery of the device by glowing the number of LEDs.

Signature of faculty in-charge with Date: