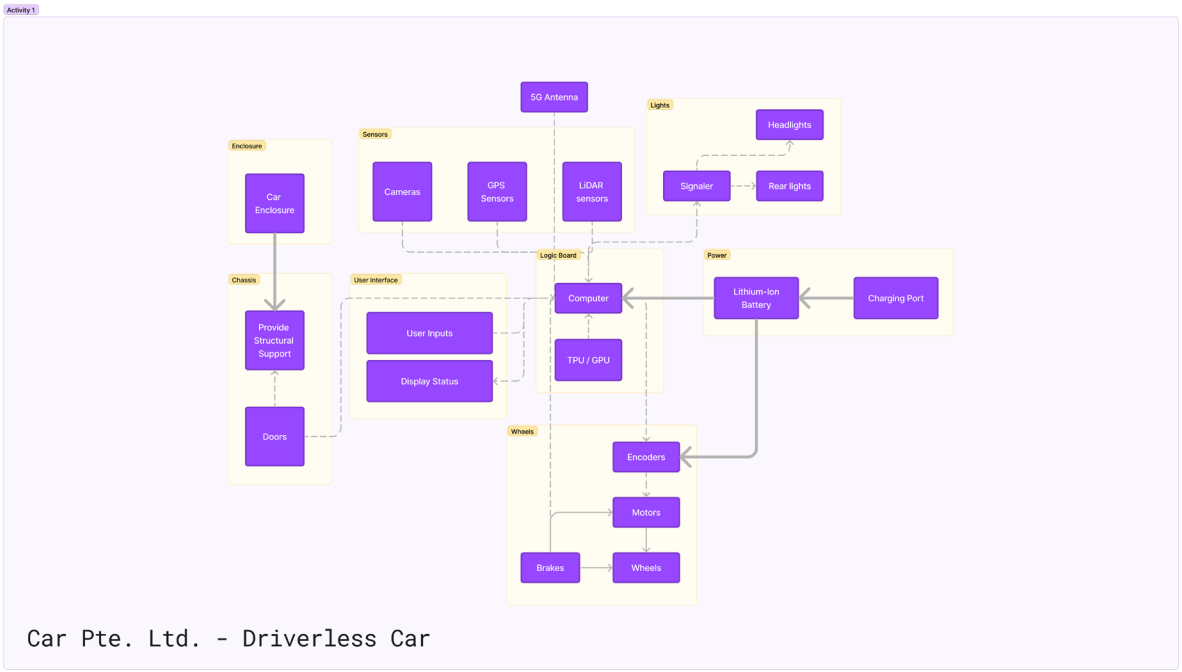
EEP1 ELogBook – Week 3

24/8/2023 – 29/8/2023

AXXXXXXX - Brians Tjipto Meidianto

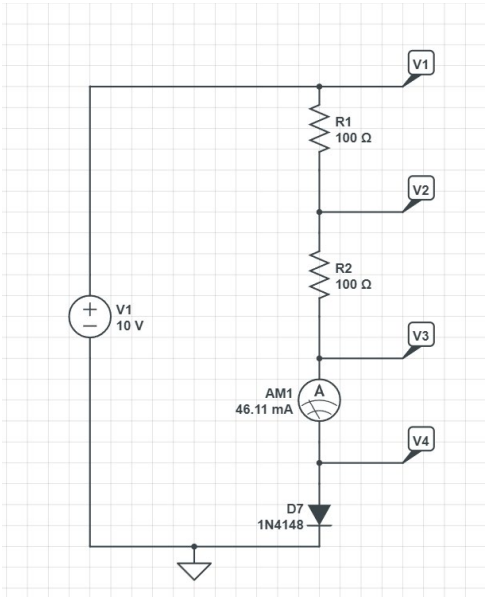
Studio

Activity 1



Car Pte. Ltd. - Driverless Car

Activity 2

- DC Operating Point Simulation
    1. 

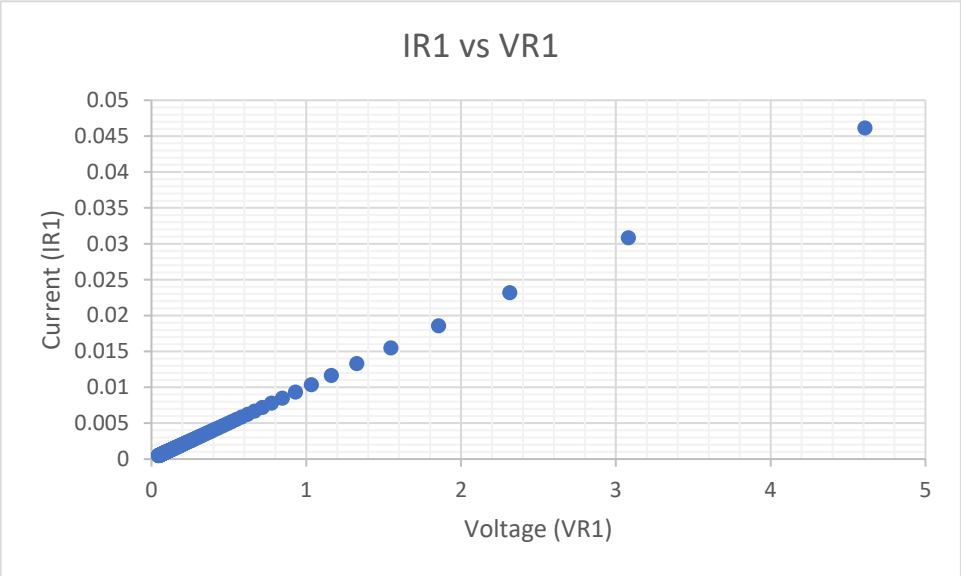
2.

V(V1)	10.00 V
V(V2)	5.389 V
V(V3)	778.9 mV
V(V4)	778.9 mV

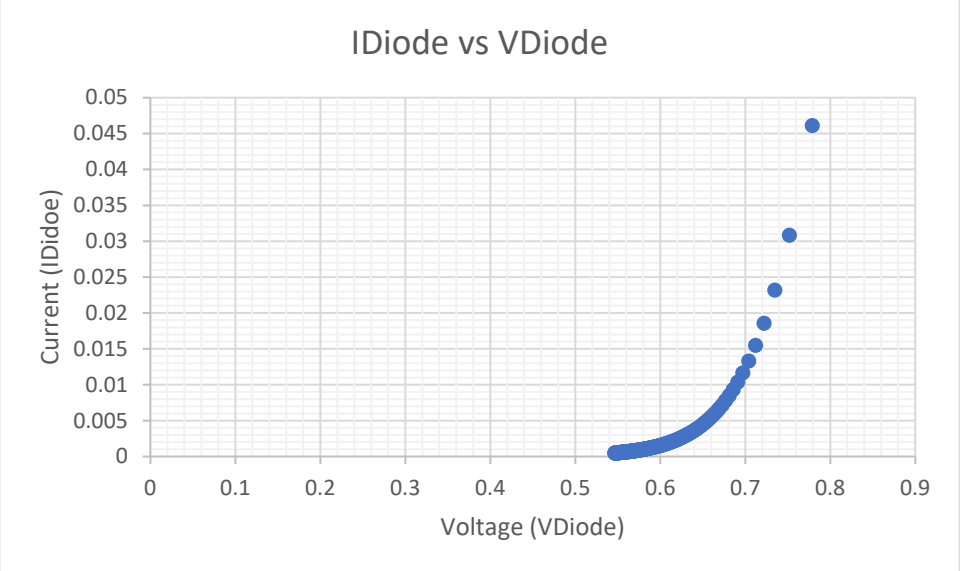
3. Positive Direction (Clockwise), 46.11mA

- DC Sweep Simulation

1.



2.

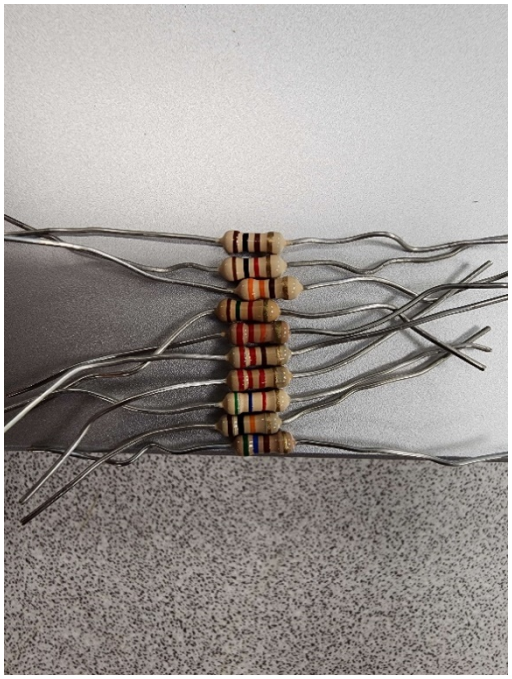


3. The I-V Graph of R1 is a linear line, while the I-V Graph of the Diode is an exponential line.

Lab

Activity 1:

1. Resistors
    a. Colour
        i. Brown – Black – Brown – Gold
        ii. Brown – Black – Red – Gold
        iii. Orange – Orange – Brown – Gold
        iv. Brown – Green – Red – Gold
        v. Red – Red – Orange – Gold
        vi. Red – Red – Brown – Gold
        vii. Red – Red – Red - Gold
        viii. Green – Blue – Red – Gold
        ix. Brown – Black – Orange – Gold
        x. Green – Blue – Brown – Gold

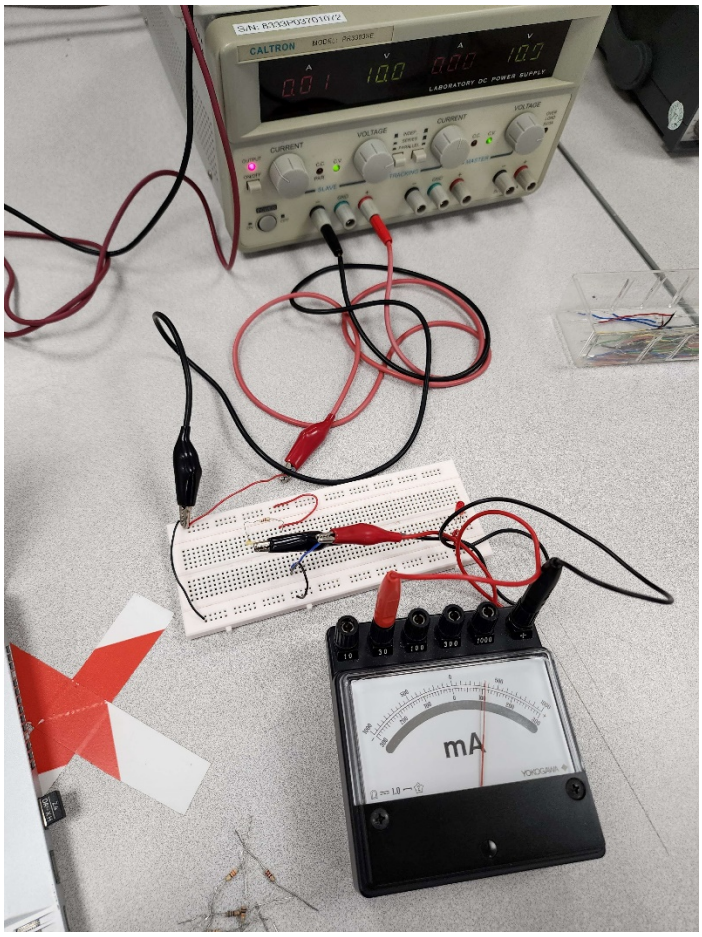


    b. Value
        i. 100 Ω ±5%
        ii. 1000 Ω ±5%
        iii. 330 Ω ±5%
        iv. 1500 Ω ±5%
        v. 22 kΩ ±5%
        vi. 220 Ω ±5%
        vii. 2200 Ω ±5%
        viii. 5600 Ω ±5%
        ix. 10 kΩ ±5%
        x. 560 Ω ±5%
    c. Tolerance

Original Value	Lower Bound	Upper Bound
100 Ω	95 Ω	105 Ω
1,000 Ω	950 Ω	1,050 Ω
330 Ω	314 Ω	347 Ω
1,500 Ω	1,425 Ω	1,575 Ω
22,000 Ω	20,900 Ω	23,100 Ω
220 Ω	209 Ω	231 Ω
2,200 Ω	2,090 Ω	2,310 Ω
5,600 Ω	5,320 Ω	5,880 Ω
10,000 Ω	9,500 Ω	10,500 Ω
560 Ω	532 Ω	588 Ω

    d. 979Ω / 0.979kΩ

Activity 2:



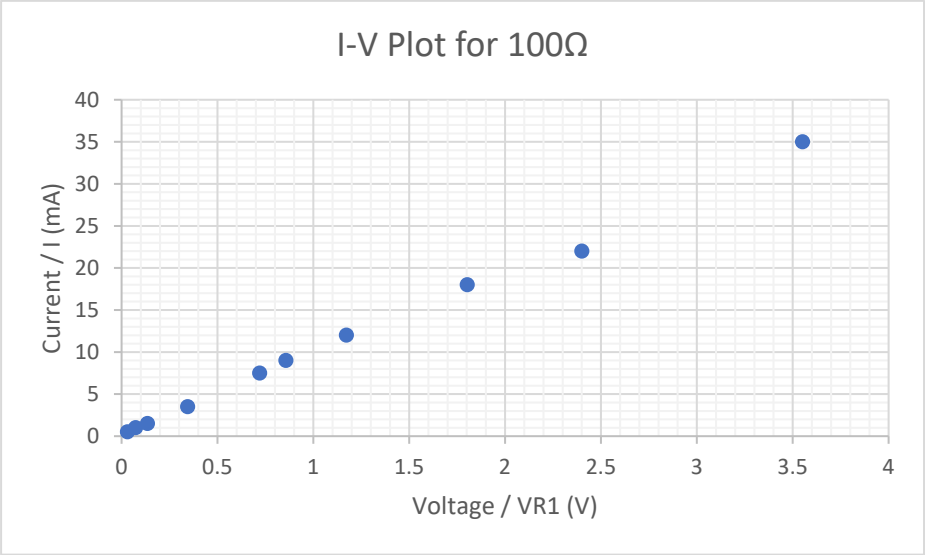
1. 10mA
2. 10.10V
3. $R = \frac{V}{I} = \frac{10.10}{0.01} = 1010\ \Omega$, The Ohm's Law is verified as it is still in the accepted range.

Activity 3:

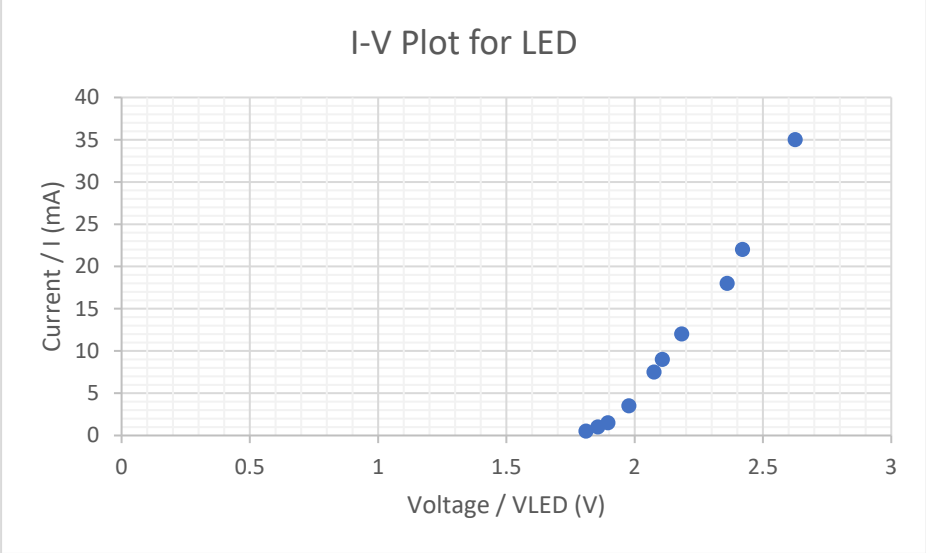
1. Red
2. Data Entry Table

R2	I	VR1	VLED
100	35	3.552	2.626
220	22	2.401	2.421
330	18	1.803	2.361
560	12	1.173	2.184
820	9	0.858	2.108
1000	7.5	0.721	2.076
2200	3.5	0.345	1.978
5600	1.5	0.136	1.896
10000	1	0.074	1.857
22000	0.5	0.031	1.811

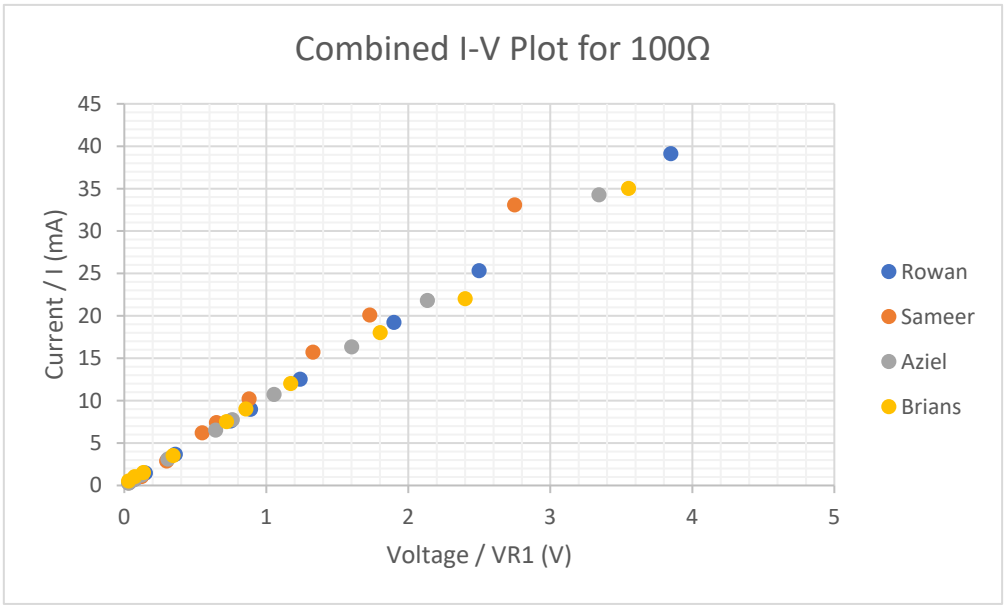
3. I-V Plot for the 100Ω Resistor



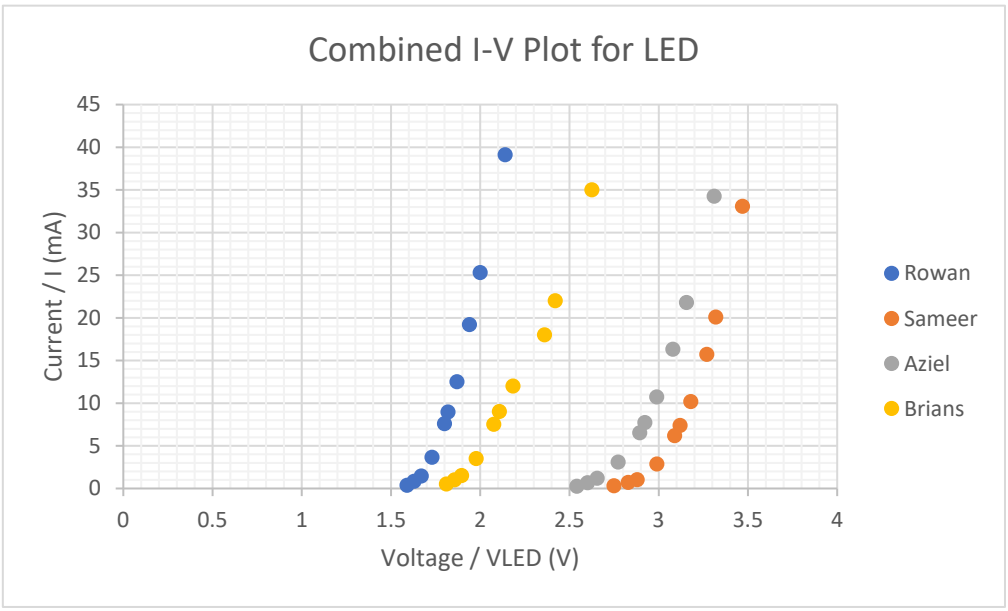
4. I-V Plot for the LED



5. Combined Subgroup I-V Plot for 100Ω Resistor



6. Combined Subgroup I-V Plot for LED



Extra Activity:

1. Circuit 1
    a. VR1: 2.516V
    b. VR2: 2.524Vss
    c. VR3: 5.043V
    d. IR1: $\frac{2.516}{100} = 25.16mA$
    e. IR2: $\frac{2.524}{100} = 25.24mA$
    f. IR3: $\frac{5.043}{150} = 33.62mA$
2. Circuit 2
    a. VR1: 2.868V
    b. VR2: 2.191V
    c. VR3: 2.172V
    d. IR1: $\frac{2.868}{100} = 28.68mA$
    e. IR2: $\frac{2.191}{150} = 14.61mA$
    f. IR3: $\frac{2.172}{150} = 14.48mA$

Activity 4:

#	Multimeter 1 (V)	Multimeter 2 (V)
1	3.50	4.00
2	4.20	4.08
3	4.10	3.82
4	4.40	4.10
5	3.80	4.00
Mean	4.00	4.00
Standard Deviation	0.35	0.11

$$\sqrt{\frac{(3.50-4.00)^2+(4.20-4.00)^2+(4.10-4.00)^2+(4.40-4.00)^2+(3.80-4.00)^2}{4}}$$

=0.35

$$\sqrt{\frac{(4.00-4.00)^2+(4.08-4.00)^2+(3.82-4.00)^2+(4.10-4.00)^2+(4.00-4.00)^2}{4}}$$

=0.11

1. Based on the calculated standard deviations, we can conclude that Multimeter 2 (with an SD of 0.11) is more precise than Multimeter 1 (with an SD of 0.35). A smaller standard deviation indicates less variability or spread in the measurements, which in turn reflects higher precision. Therefore, Multimeter 2 provides more consistent measurements compared to Multimeter 1.
2. The resolution represents the smallest difference between two values that the instrument can distinguish.
    - For Multimeter 1, the smallest increment between measurements is 0.1 V (from 3.5 V to 4.4 V). Therefore, the resolution is 0.1 V.
    - For Multimeter 2, the smallest increment between measurements is 0.02 V (from 3.82 V to 4.10 V). Therefore, the resolution is 0.02 V.

    In summary, the resolution of Multimeter 1 is 0.1 V, and the resolution of Multimeter 2 is 0.02 V. This means that Multimeter 2 can measure smaller differences in voltage compared to Multimeter 1, making it more sensitive in detecting subtle changes in the measured values.