(d) Change the scaling and position of the plot using the **Scale** knob and **Position** knob of both channels, respectively if you need.

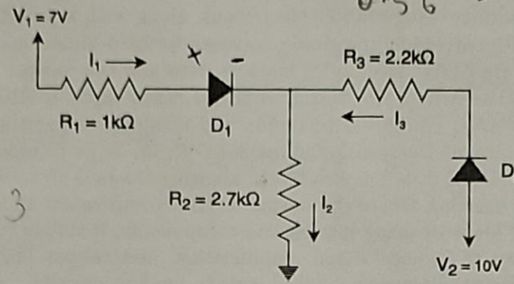
You will see a small screen showing the I-V characteristics graph using the **XY** mode of the oscilloscope. The XY mode plots the voltage data of CH1 and CH2 in the x-axis and y-axis respectively. So, the x-axis represents V_D. As, $I_D = I_R \propto V_R$, the y-axis represents I_D.

(e) Observe the I-V graph and capture it with a camera.

Task-02: Verification of CVD model

0.56 $-7 + I_1 + 2.7I_1 + 2.7I_3 = 0$

$\Rightarrow 3.7I_1 + 2.7I_3 = 6.44$



$-10 + 0.56 + 2.2I_3 + 2.7I_1 + 2.7I_3 = 0$

$\Rightarrow 2.7I_1 + 4.9I_3 = 9.44$

Figure 8: *Circuit-2*

Procedure

1. Use the Digital Multimeter to measure the resistances R_1, R_2, and R_3, as well as the forward voltage drops V_{DO_1} and V_{DO_2} of diodes D_1 and D_2, respectively. Fill in the tables below with the measured values.
2. Construct the *Circuit-2* given above.
3. Use the DC Power Supply to set $V_1 = 7V$ and $V_2 = 10V$ with 0.5A current limit
4. Now, measure the voltages across the resistances and fill out the tables.
5. For theoretical analysis, assume the diode follows the Constant Voltage Drop (CVD) model with a forward voltage drop of V_{DO}. Use the experimental values for both V_{DO} and the resistor in calculations to minimize error.

$I_1 = 0.56$

$I_3 = 1.62$

	V_{Do_1} (V)	V_{Do_2} (V)	R_1 (kΩ)	R_2 (kΩ)	R_3 (kΩ)	V_{R1} (V)	V_{R2} (V)	V_{R3} (V)	$I_1 = \frac{V_{R1}}{R_1}$ (mA)	$I_2 = \frac{V_{R2}}{R_2}$ (mA)	$I_3 = \frac{V_{R3}}{R_3}$ (mA)	D_1 (on/off)	D_2 (on/off)
Experimental	0.56	0.56	0.987	2.697	2.15	0.55	5.47	3.6	0.56	2.03	1.67	on	on
Theoretical			1K	2.7k	2.2K	0.56	5.8	3.5	0.56	2.18	1.62	on	on

Percentage of error $= \left\lvert \frac{\text{Experimental} - \text{Theoretical}}{\text{Theoretical}} \right\rvert \times 100\%$	For I_1	For I_2	For I_3
	0%	6.89%	3.08%

Task-03: Logic Gate Implementation

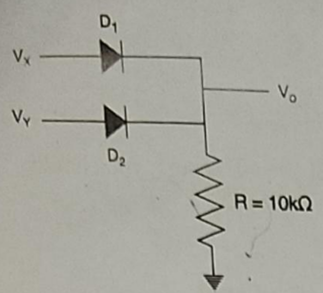


Figure 8a: *Circuit-3 (Diode OR)*

9'7 = D1

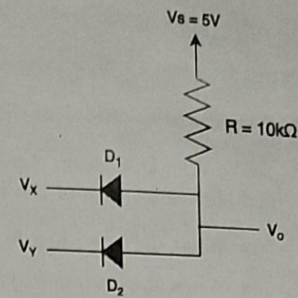


Figure 8b: *Circuit-4 (Diode AND)*

Procedure

1. On a trainer board, set up Circuit-3 (Diode OR).
2. Connect the gate terminals V_X and V_Y to data switches. These switches provide approximately 5V.
3. The Boolean outputs can also be determined by the state of an LED. Connect V_O to one of the LEDs and check it. When the LED is ON, the Boolean output is 1. Similarly, when the LED is OFF, the Boolean output is 0.
4. Next, use the input voltage combinations from the data table of the OR gate below via data switches and observe the state of the LED.
5. Verify the truth table of the OR gate. And then disconnect the LED and measure V_O using multimeter.
6. Now repeat steps 1 through 5 for Circuit-4 (Diode AND). The only change is to connect V_S to the 5V source of the trainer board.

For OR Gate

Input Voltage, V_X (V)	Input Voltage, V_Y (V)	State of LED (On/Off)	Boolean Output (0 or 1)	Output Voltage, V_O (V) (LED Disconnected)
0V	0V	off	0	0
0V	5V	on	1	4.44
5V	0V	on	1	4.11
5V	5V	on	1	4.44

For AND Gate

Input Voltage, V_X (V)	Input Voltage, V_Y (V)	State of LED (On/Off)	Boolean Output (0 or 1)	Output Voltage, V_O (V) (LED Disconnected)
0V	0V	off	0	0
0V	5V	off	0	0.5
5V	0V	off	0	0.5
5V	5V	on	1	5.03

Purbyas 15.07.2025

Signature of the lab faculty

Report Submission Guidelines

1. Attach the signed Data Sheet (if any)
2. Attach the captured images (if any)
3. Answer the questions in the "Test Your Understanding" section
4. Add a brief Discussion regarding the experiment. For the Discussion part of the lab report, you should include the answers of the following questions in your own words:
   - What did you learn from this experiment?
   - What challenges did you face and how did you overcome the challenges? (if any)
   - What mistakes did you make and how did you correct the mistakes? (if any)
   - How will this experiment help you in future experiments of this course?

Test Your Understanding

Answer the following questions:

1. $R = 1k\Omega$ was used in the experiment. If we use $R = 2.2k\Omega$, will there be any problem in observing the I-V characteristics plot? Explain briefly.

   Answer:

   There won't be any problem in observing iv characteristic but the current will be lesser, Making the R bigger will shift the straight line toward x axis. So the iv graph will be flatter.

2. From the I-V characteristics of a diode that you obtained, which devices can be used to model the diode?

   Answer:

   The diode was behaving like a non linear device, We can't exactly model the diode with the devices we have worked with but we can model each part of its IV characteristics with voltage source, or voltage soure with resistor series.

3. Compare the ideal diode model, CVD model and CVD + r model. Which model is better and why?

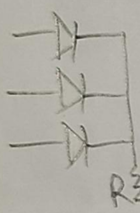
Answer:

while off all the diode models acts as open circuit. while on they act as short circuit, voltage source, voltagesource with a resistor in series respectively.

Ideal model is simple and good for theoretical analysis.
cvd is more realistic than ideal, still simple.
cvd+r is most accurate among these three.

4. Design a 3-input OR gate using diodes and explain why a pull-down resistor is necessary. What happens if the resistor value is too large or too small?

Answer:

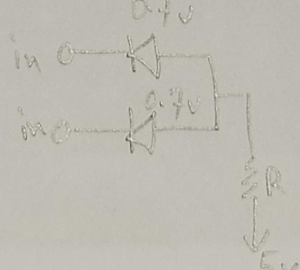


If any diode is on the other node will have a certain voltage but without the R the other part will have 0 voltage. Thats two different voltage for a single node which is not possible. So the R is used for voltage drop.
Too low pulldown resistor may waste current and too high makes the output slow to fall and unreliable.

5. Implement a 2-input AND gate using diodes. If the input high level is 5V and low level is 0V, calculate the actual output levels considering 0.7V diode drops.

Answer:

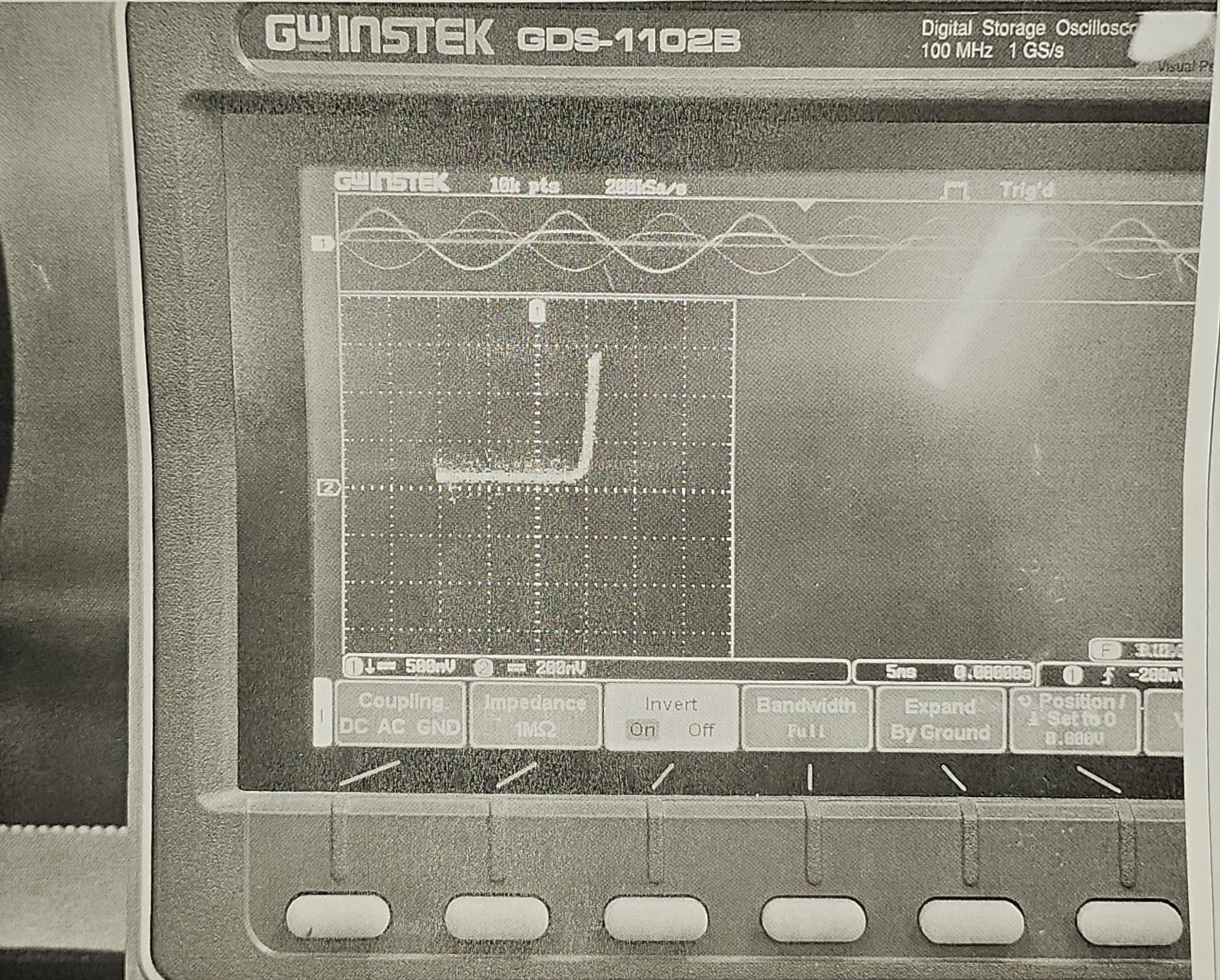
in	in	out
0	0	0.7
0	5	0.7
5	0	0.7
5	5	5



I leannt how to implement And, Or gate using diodes. from this experiment, their iv charac characteristics.

I was measuring the Vo while keeping the led on which gave less voltage at first. Later I removed the led while measuring.

This experiment may help me build a complex circuit using And, Or gate. Also controling current flow with diode.



GW INSTEK GDS-1102B
Digital Storage Oscillosc
100 MHz 1 GS/s
GW INSTEK
10k pts
200kSa/s
Trig'd
500mV
200mV
5ns
Coupling
DC AC GND
Impedance
1MΩ
Invert
On Off
Bandwidth
Full
Expand
By Ground
Position /
Set to 0
0.000V