

Exercise 1 - Decimal to Binary Conversion

A. Manual Decimal to Binary Conversion

Convert the following decimals to binary by hand (you can use the calculator)

- 12
- 25

B. Automate Decimal to Binary Conversion

Implement a simple program in your preferred programming language to automate the decimal to binary

The program should accept an integer from the user and output the corresponding binary number.

Suggestion: Draw a flow chart

Suggestion2: Use the modulo operator - %

Test your program with the following numbers:

Input	Expected Output
5	101
1024	10000000000
125	1111101

Exercise 2 - Binary to Decimal Conversion

A. Manual Binary to Decimal Conversion

Convert the following binary to decimal by hand (you can use the calculator)

- 101

- 100000
- 111111

B. Automate Binary to Decimal Conversion

Implement a simple program in your preferred programming language to automate the binary to decimal

The program should accept a binary number in string form from the user and output the corresponding decimal number.

Input	Expected Output
101	5
10000000000	1024
1111101	125

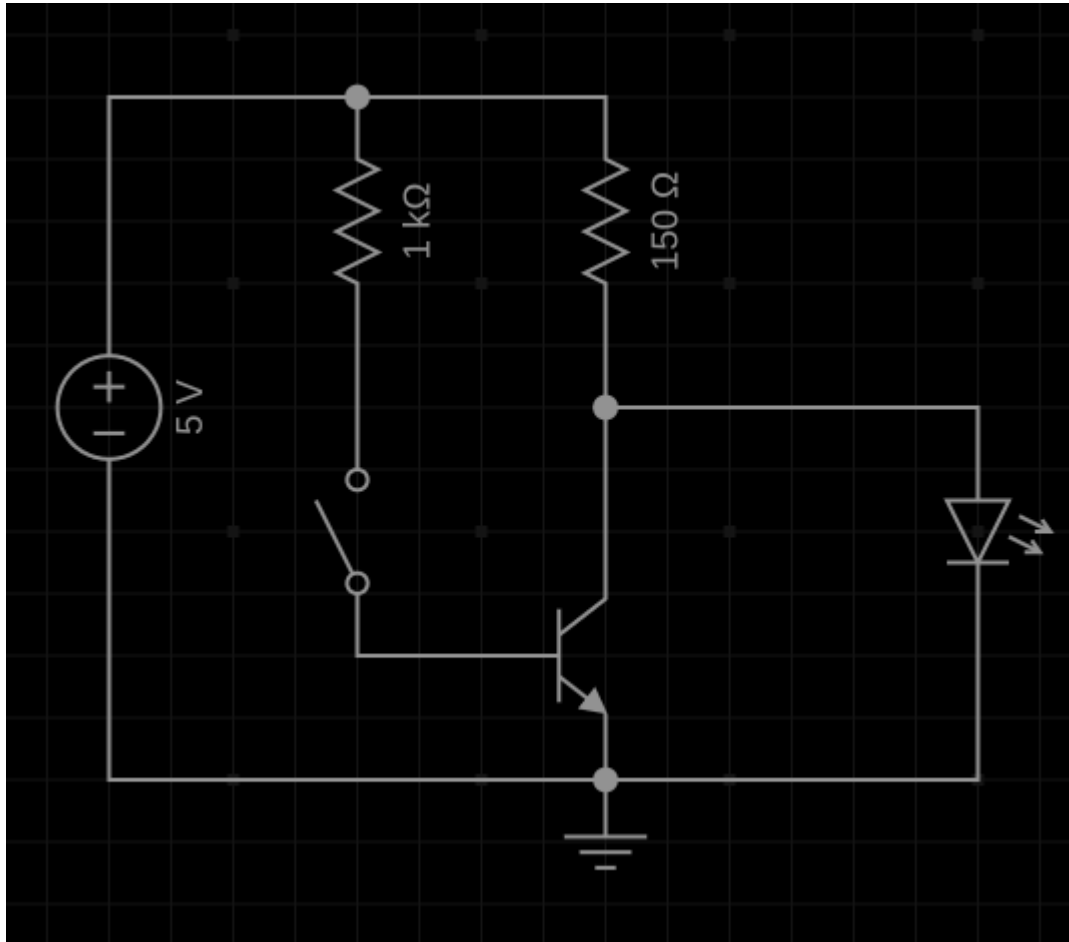
Hardware Exercises

Exercise 1 - NOT Gate with Transistors

The circuit should include:

- A push button as input
- NPN Transistor
- 1k Ohm resistor for NPN base.

- LED for output (with appropriate resistor)

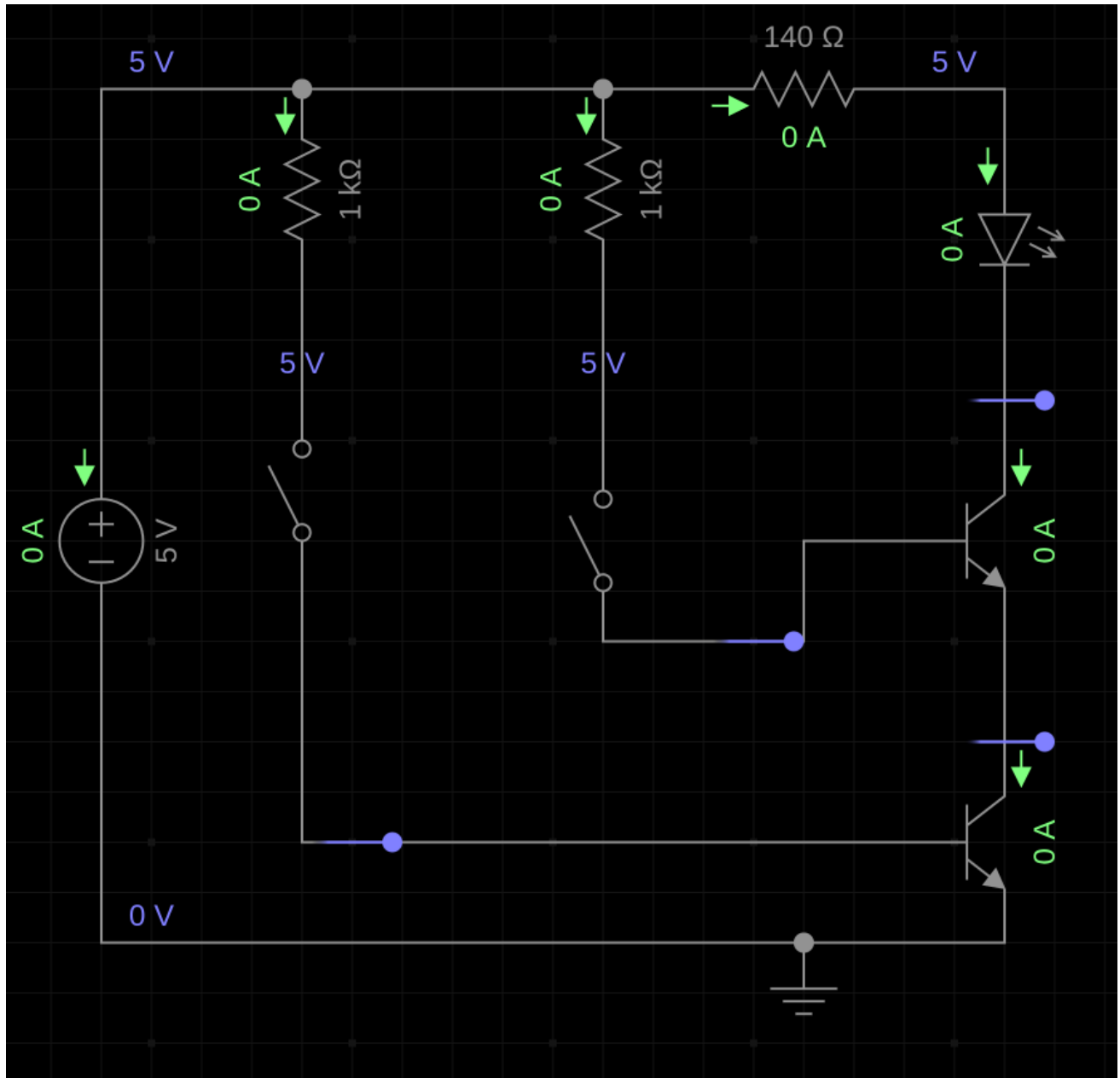


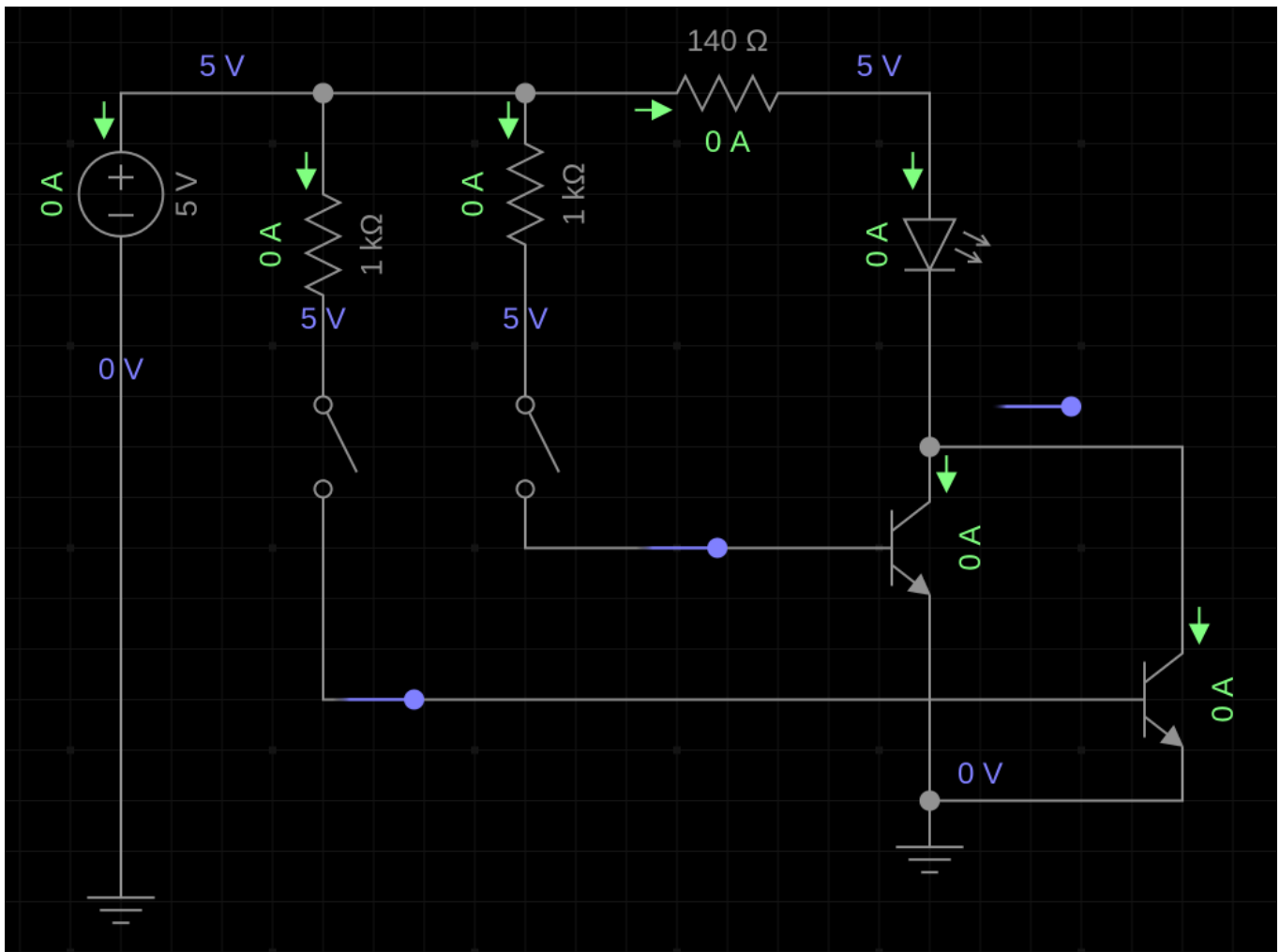
Exercise 2 - AND and OR Gate with Transistors

The circuit should include:

- 2 push buttons as input
- 2x NPN Transistor
- 2x 1k Ohm resistor for NPN base.

- LED for output (with appropriate resistor)





Exercise 3 - AND Gate [74HCT08](#)

Design and build a 2-input AND gate circuit using the 74HCT08 IC.

Make the truth table for your circuit.

The circuit should include:

- A 74HCT08 IC (which contains multiple 2-input AND gates).
- Two push buttons as inputs.
- An LED to indicate the output (with appropriate resistor).

Suggestion: Use pull-down resistors for your inputs (Read Section "8.2.1.2 Input Considerations")

Exercise 4 - OR Gate [74HCT32](#)

Design and build a 2-input OR gate circuit using the 74HCT08 IC.

Make the Truth table for your circuit.

The circuit should include:

- A 74HCT32 IC (which contains multiple 2-input OR gates).
- Two push buttons as inputs.
- An LED to indicate the output (with appropriate resistor).

Suggestion: Use pull-down resistors for your inputs (Read Section "9.2.1.2 Input Considerations")

Exercise 5 - Make a 1Hz clock signal with a [NE555](#) timer

Design and build a clock signal generator using a 555 timer IC in astable mode to produce:

- A square wave at:
 - a frequency of 1 Hz.
 - a duty-cycle of 50%

Check your signal with the Oscilloscope

The circuit should include:

- A 555 timer IC configured in astable mode.
- An LED to indicate the output.

Assume:

- $R1 = 1k \text{ Ohm (kilo Ohm)}$
- $C = 10\mu F \text{ (microFarad)}$

Remember:

- $f = 1.44 / [(R1 + 2 * R2) * C]$
- $\text{Duty Cycle} = (R1 + R2) / (R1 + 2 * R2)$

Suggestion: Check slides of Lecture 2 and Section 8.3.2 of the Datasheet