LAB REPORT: 3

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GROUP NO: 1

AIM OF THE EXPERIMENT:

PART A:

To design, assemble and test a (4*1) Multiplexer using basic logic gates (whose select lines and inputs are through Arduino).

The aim of the experiment is to set up the circuit given to us and tabulate the readings for the required outputs for all input combinations.

PART B:

To design, assemble and test a (1*4) Demultiplexer using basic logic gates (whose select lines and inputs are through Arduino).

The aim of the experiment is to set up the circuit given to us and tabulate the readings for the required outputs for all input combinations.

PART C:

To design, assemble and test the combination of a Multiplexer and a Demultiplexer using basic logic gates (whose select lines and inputs are through Arduino). Moreover, testing different combinations of inputs at MUX and then checking them at DEMUX output using LEDs.

The aim of the experiment is to set up the circuit given to us and tabulate the readings for the required outputs for all input combinations.

ELECTRONIC COMPONENTS USED:

PART A:

Arduino Uno R3, seven LEDs, seven resistances (1 Kohm each), Hex Inverter 74HC04 NOT Gate, 74HC32 Quad OR Gate, two 74HC11 Triple 3-Input AND Gate and connecting wires.

PART B:

Arduino Uno R3, seven LEDs, seven resistances (1 Kohm each), Hex Inverter 74HC04 NOT Gate, two 74HC11 Triple 3-Input AND Gate and connecting wires.

PART C:

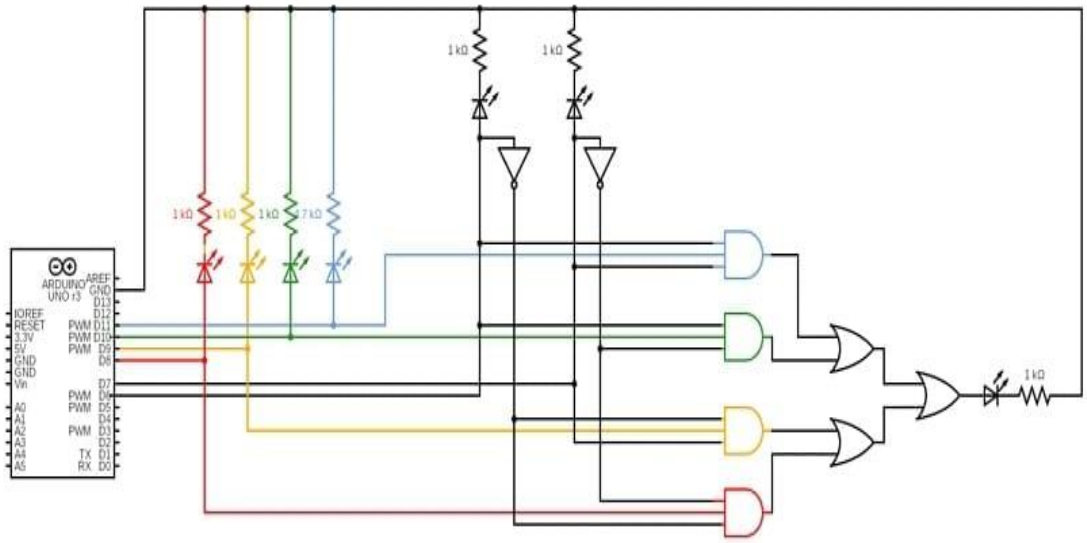
Arduino Uno R3, four LEDs, five resistances (1 Kohm each), Hex Inverter 74HC04 NOT Gate, 74HC32 Quad OR Gate, two 74HC11 Triple 3-Input AND Gate and connecting wires.

Arduino Uno R3, four LEDs, four resistances (1 Kohm each), two 74HC11 Triple 3-Input AND Gate and connecting wires.

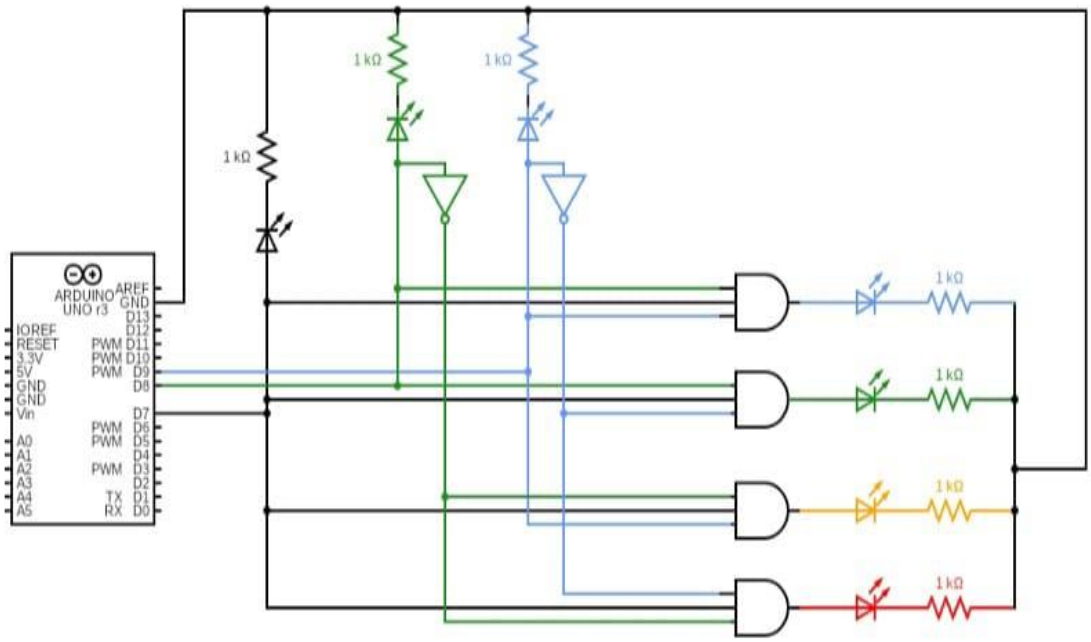
In addition, 2 LEDs and two resistances (1 Kohm each) for the Select LEDs.

REFERENCE CIRCUITS:

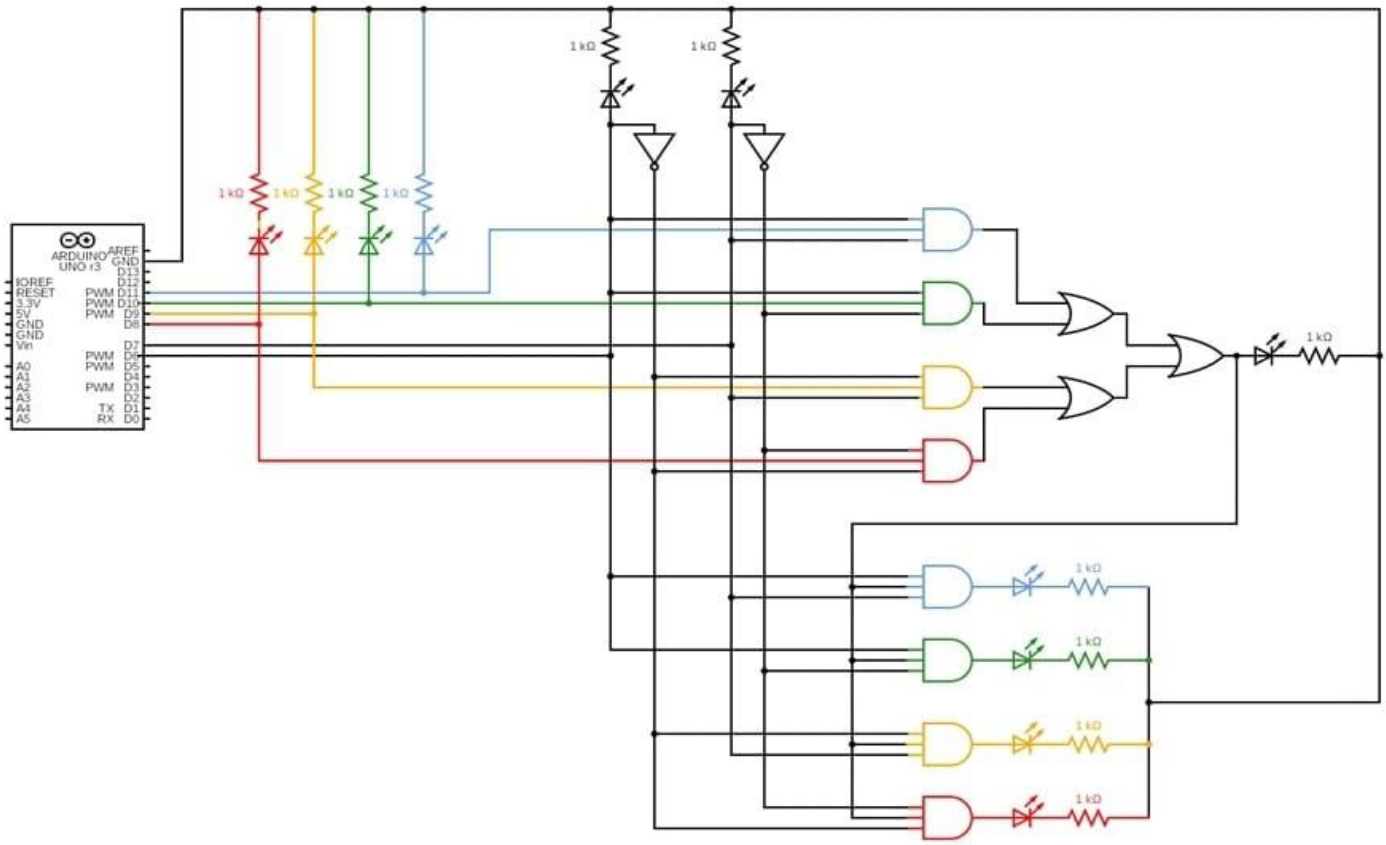
PART A: CIRCUIT DIAGRAM TO ILLUSTRATE THE WORKING OF A MULTIPLEXER



PART B: CIRCUIT DIAGRAM TO ILLUSTRATE THE WORKING OF A DEMULTIPLEXER



PART C: CIRCUIT DIAGRAM TO ILLUSTRATE THE WORKING OF A MULTIPLEXER AND A DEMULTIPLEXER AS A COMBINATION



PROCEDURE:

PART A:

1. Set up the circuit as shown in the circuit diagram above for Part A on the breadboard
2. Take an Arduino and connect its pins 6,7,8,9,10,11 to Select LED 1, Select LED 2, input LED A, input LED B, input LED C and input LED D respectively using connecting wires as shown.
3. Connect all the LEDs with appropriate resistances (here 1kohm each).
4. For the connections:

- Connect LED A to the NOT outputs of both S1 and S2 and pass them through AND gate.
- Connect LED B to S2 and the NOT output of S1 and pass them through AND gate.
- Connect LED C to S1 and the NOT output of S2 and pass them through AND gate.
- Connect LED D to S1 and S2 and pass them through the AND gate.
- Connect the outputs of the above four processes to a OR gate.

5. Make sure all the gates as well as the LEDs are well grounded and proper power supply is given to each gate.
6. Write an Arduino code to give different combinations of inputs at input and select lines and view them using LED at the output line.
7. Verify the multiplexer function by tabulating the values of the output(s) for all input combinations.

PART B:

1. Set up the circuit as shown in the circuit diagram above for Part B on the breadboard.
2. Take an Arduino and connect its pins 9,10 and 11 to input LED, Select LED 1 and Select LED 2 respectively using connecting wires as shown.
3. Connect all the LEDs with appropriate resistances (here 1kohm each).
4. Make sure all the gates as well as the LEDs are well grounded and proper power supply is given to each gate.
5. The serial inputs were given through Arduino, and different combinations of S1 and S2(00,01,10,11) were achieved for outputting LEDs A, B, C and D respectively using triple 3 input AND gates.
6. Write an Arduino code to give different combinations of inputs at input and select lines and view them using LEDs at the output line.
7. Verify the demultiplexer function by tabulating the values of the output(s) for all input combinations.

PART C:

1.Take an Arduino board, and connect LEDs denoting inputs A, B, C, D and select lines S1 and S2, to it through connecting wires.

2.Connect a hex inverter (NOT Gate) to the input LEDs, S1 and S2, and use 3-input AND gates to take appropriate inputs.

3.Connect the output pin to an LED to indicate whether the output is 1 or 0.

4.Take the output pin connection to the second circuit and connect LEDs denoting input I (output for prev. circuit), and select lines S1 and S2, to it through connecting wires.

5.Connect a hex inverter (NOT Gate) to the input LEDs, S1 and S2, and use a 3-input AND gate to take appropriate inputs.

6.Connect the output pins to LEDs to indicate whether the output is 1 or 0, for each of A, B, C, D.

7. Write an appropriate code for the Arduino to function.

CONCLUSION:

PART A:

We have successfully constructed a (4x1) multiplexer, using basic logic gates.

A multiplexer (or mux) is a device that selects one of several analog or digital input signals and forwards the selected input into a single line. A multiplexer with 2 ^n inputs have n select lines, which are used to select which input line to send to the output.

S1	S2	NOT S1	NOT S2	OUTPUT
0	0	1	1	A
0	1	1	0	B
1	0	0	1	C
1	1	0	0	D

PART B:

We have successfully constructed a (1x4) de-multiplexer, using basic logic gates.

A demultiplexer (or demux) is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input. A multiplexer is often used with a complementary demultiplexer on the receiving end.

INPUT	S1	S2	A	B	C	D
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1

PART C:

We have successfully constructed a (4x1) multiplexer in combination with a (1x4) De-multiplexer, using basic logic gates.

The output of the mux should be given as an input to the demux, and the select lines of both the mux and the demux must also be taken from Arduino to successfully simulate and understand the working of this combination.

LINKS OF TINKERCAD SIMULATIONS:

PART A:

https://www.tinkercad.com/things/0B5Rmz4xUHG

PART B:

https://www.tinkercad.com/things/d0CoFSWiquB

PART C:

https://www.tinkercad.com/things/18bnkxhsWu7

THANK YOU!