DIGITAL CIRCUITS LABORATORY
Experiment-6
Multiplexers

Tanish H Talapaneni
200020050

Aim: To study the working of a Multiplexer and design the same circuit on the breadboard

Summary: Implementation of the designed Multiplexer Circuit using the DM741 IC. Rigging up of the designed circuit.

Components used:DM741 IC(Multiplexer), DIP Switches, LED Display, Breadboard, Power supply, 1k ohm resistor.

Procedure:

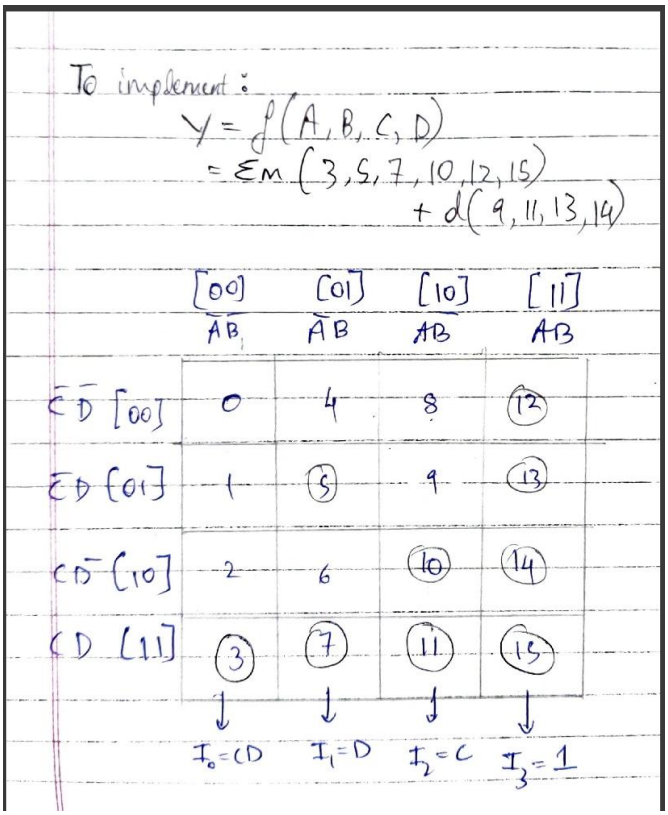
- Connect the circuit as shown in diagrams and give it power input.
- Select inputs from the truth table. Make the changes in the switch accordingly.
- Glowing LED implies that output was 1, otherwise 0.
- Verify if the simulation matches with the expected values.

Truth Table:

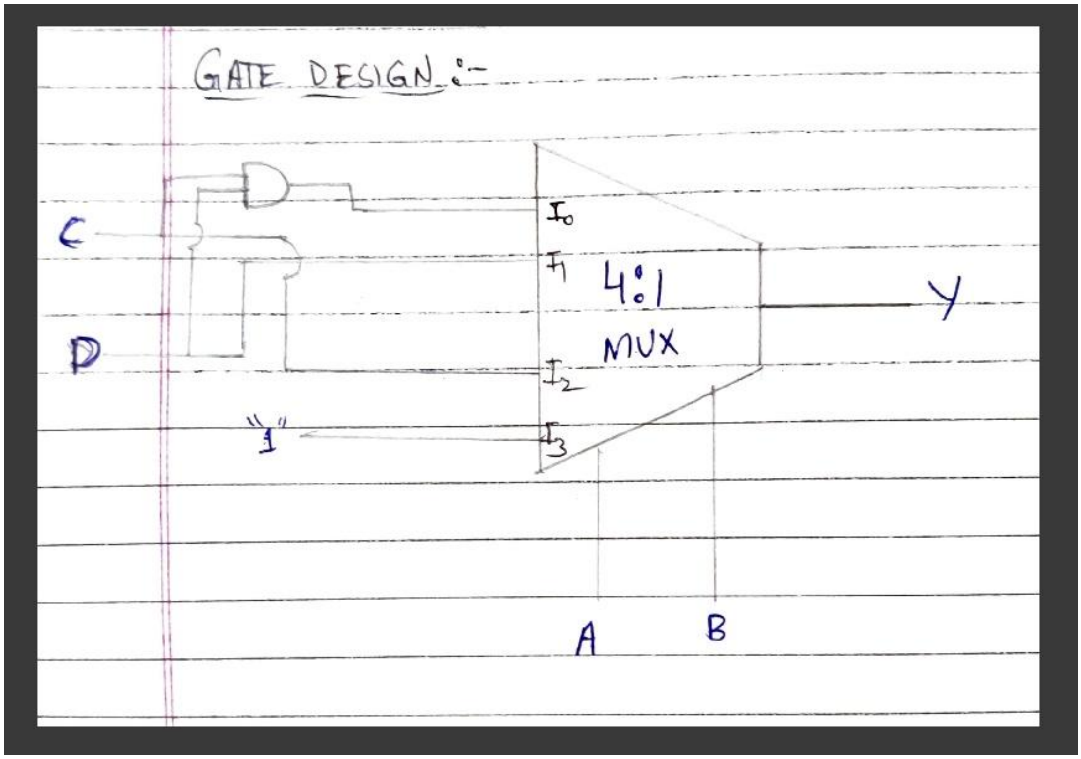
Truth-Table :-

A	B	C	D	I_0	I_1	I_2	I_3	Y
0	0	0	0	0	X	X	X	0
0	0	0	1	0	X	X	X	0
0	0	1	0	0	X	X	X	0
0	0	1	1	1	X	X	X	1
0	1	0	0	X	0	X	X	0
0	1	0	1	X	1	X	X	1
0	1	1	0	X	0	X	X	0
0	1	1	1	X	1	X	X	1
1	0	0	0	X	X	0	X	0
1	0	0	1	X	X	0	X	0
1	0	1	0	X	X	1	X	1
1	0	1	1	X	X	1	X	1
1	1	0	0	X	X	X	1	1
1	1	0	1	X	X	X	1	1
1	1	1	0	X	X	X	1	1
1	1	1	1	X	X	X	1	1

$$Y = (A+B)(C+D)$$

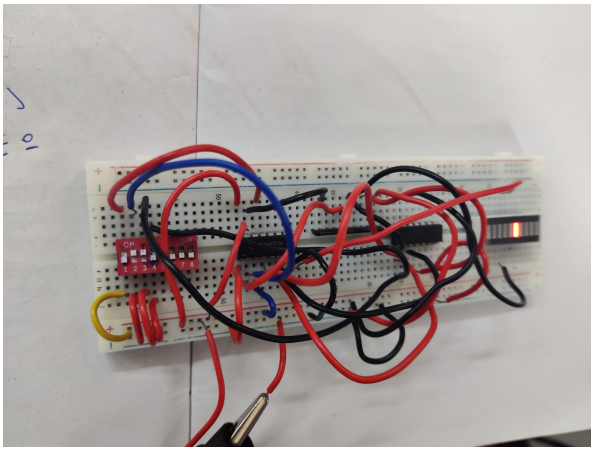

To implement :
Y = f(A, B, C, D)
= Σm (3, 5, 7, 10, 12, 15)
+ d(9, 11, 13, 14)
[00] [01] [10] [11]
$\bar{A}\bar{B}$ $\bar{A}B$ $A\bar{B}$ AB
$\bar{C}\bar{D}$ [00] 0 4 8 12
$\bar{C}D$ [01] 1 5 9 13
$C\bar{D}$ [10] 2 6 10 14
CD [11] 3 7 11 15
$I_0 = CD$
$I_1 = D$
$I_2 = C$
$I_3 = 1$

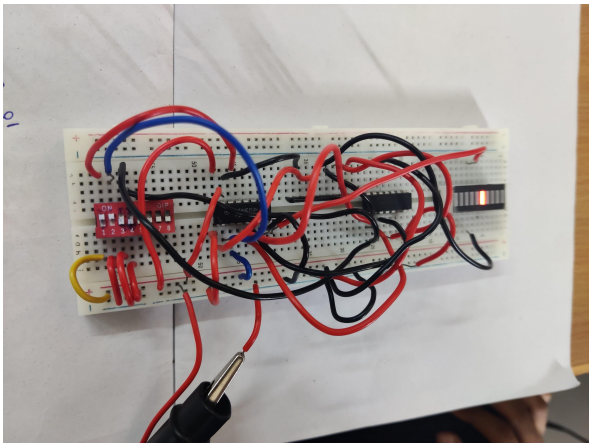
Gate Design:

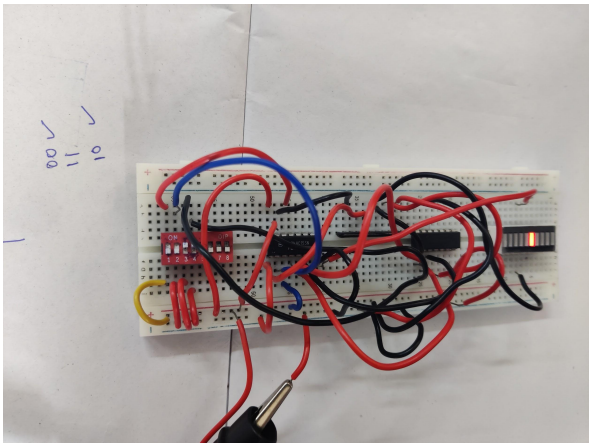

GATE DESIGN :-
C
D
"1"
I_0
I_1
I_2
I_3
4:1
MUX
Y
A
B

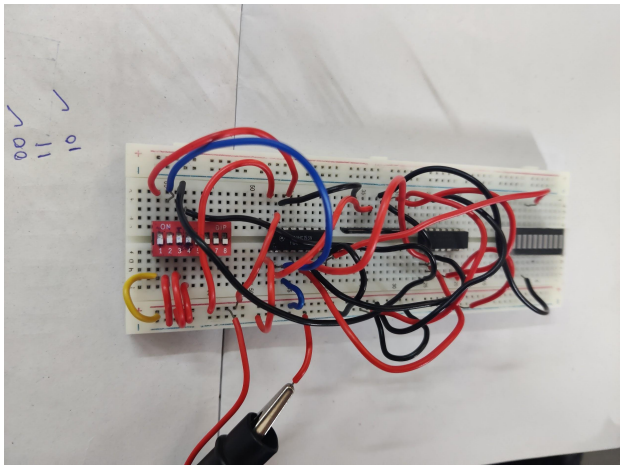
Hardware:

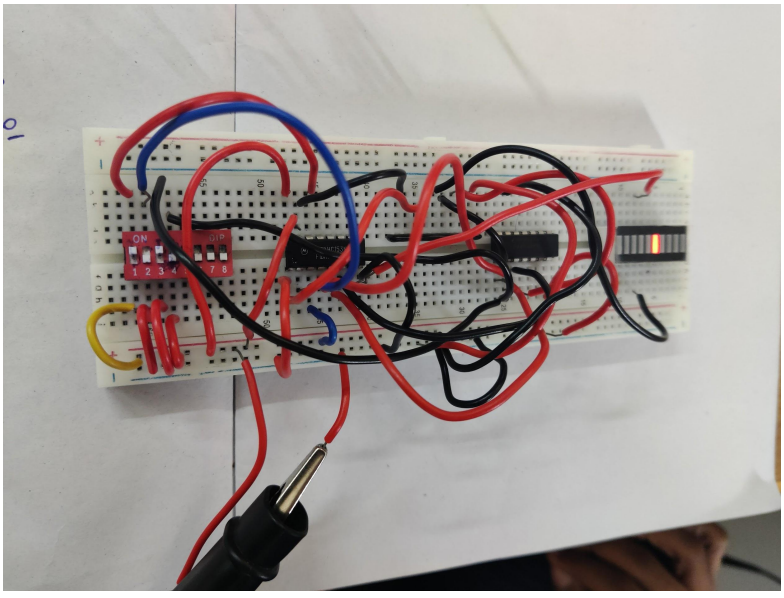
4-bit Multiplexer using DM741 IC











Results and Discussions: We finally understood how we can use Multiplexers to implement encoding of bits.We were able to verify it with the theoretical results and were also able to implement it practically using different inputs and checking the outputs obtained . We were able to deduce the connections required and successfully implement it on the breadboard

Designing the circuits helped us in understanding the logic behind multiplexers. We got a better understanding of K-Map and how to overcome issues faced while designing the circuit. Wiring up the circuit and verifying the observations with our theoretical knowledge was fun.

Conclusion:

Multiplexer: Multiplexer encodes 4 bits into 1 bit. According to the given question, the required output is (A+B)(C+D). A and B act as switches for the Multiplexer, with the 4 inputs decided by the values of C and D. The output Y corresponds to one of the inputs, based on the values of the switches A and B.