

CSCE 312 LAB 2

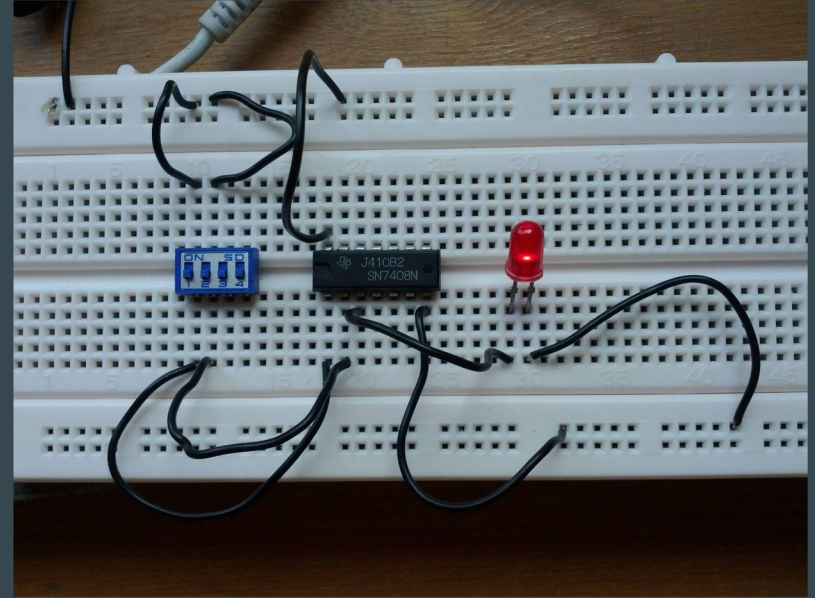
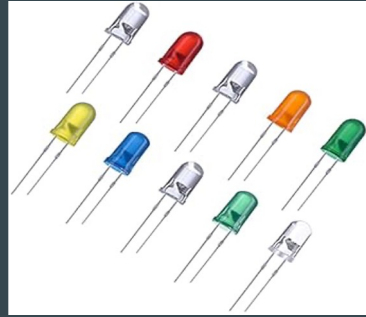
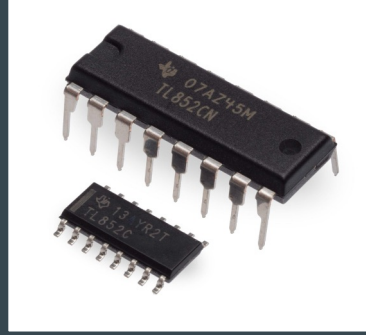
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By Dr. Eun Jung Kim

!! Deadlines !!

- Demo Deadline: Feb 08, 2024
 - You need to show demo at regular lab time
- Report Deadline: Feb 11, 2024

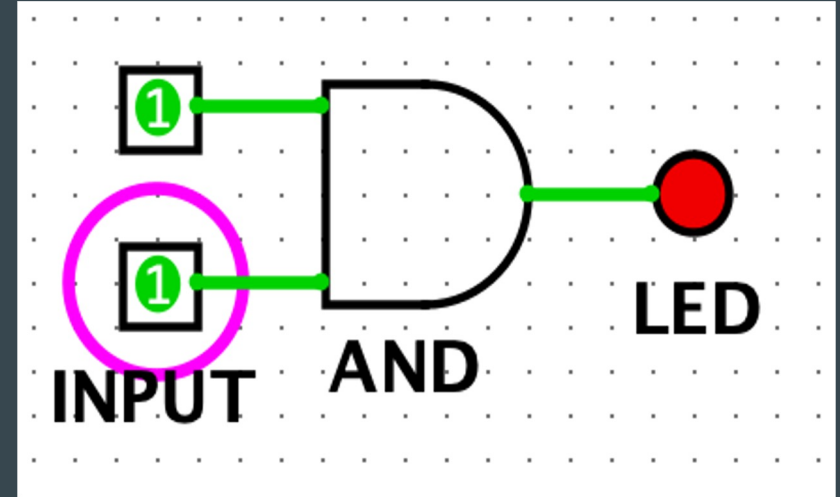
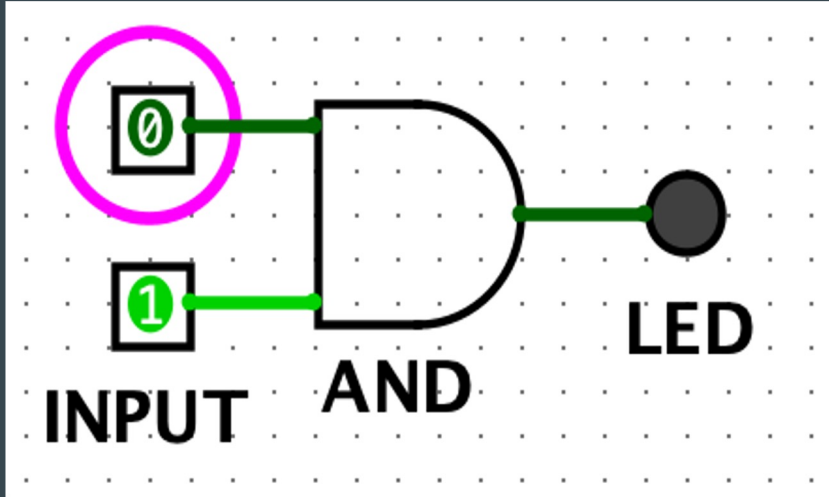
Digital Circuit Design Using Hardware



Use a Simulator Instead of Hardware

- We will use a tool named Logisim to design the circuits
- Please download Logisim to your machine using following link
<https://github.com/logisim-evolution/logisim-evolution/releases>
- Version 3.8.0

AND Gate Using Logisim



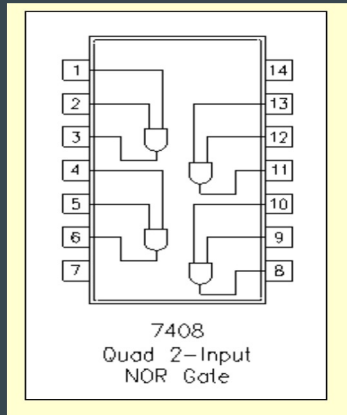
Problem 1 Part 1(Demo+Report)

Design logic circuits for

- $F = abc + ab + bc + ca$
- $G = a'b' + a'bc' + ab'c'$

Problem 1 Part 1

- What 74xx series circuit you used?
 - For AND gate, it may be 7408

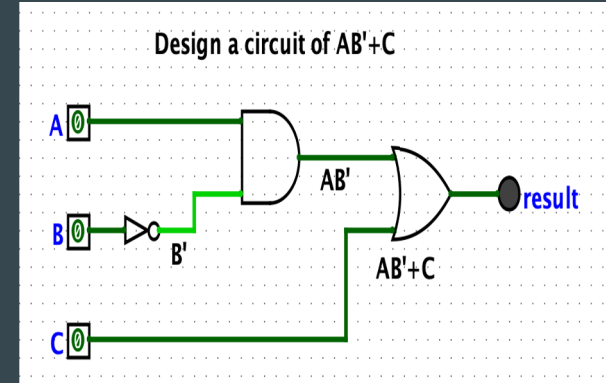


Problem 1 Part 2 and 3(Report)

Compute the propagation delay of the circuit

Assume, AND = 22ns, OR = 22ns, NOT = 22ns,
So, propagation delay = $22 + 22 + 22 = 66\text{ns}$

Mention parameters such as **Vcc**, **Temperature**, **Resistance**, **Capacitance**



Switching Characteristics at $V_{cc}=5V, T_a=25^\circ\text{C}$

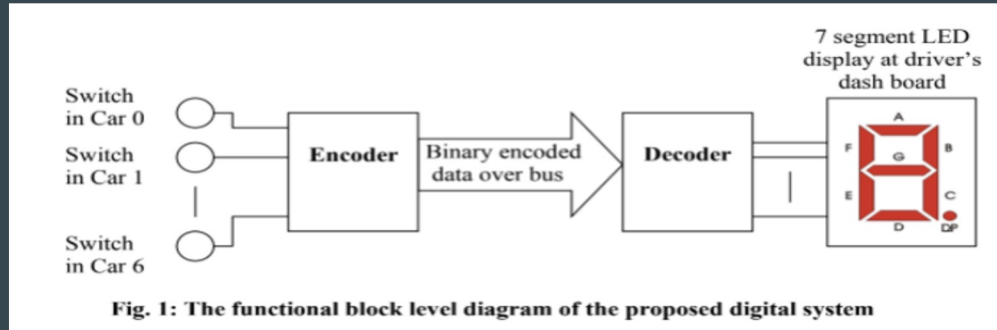
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _{plh}	Propagation Delay Time LOW-to-HIGH Level Output	Cl=15pF RI=400R			22	nS
t _{phl}	Propagation Delay Time HIGH-to-LOW Level Output	Cl=15pF RI=400R			15	nS

Problem 2

Design a car emergency system where a switch is pressed that number should be shown in 7-segment LED display.

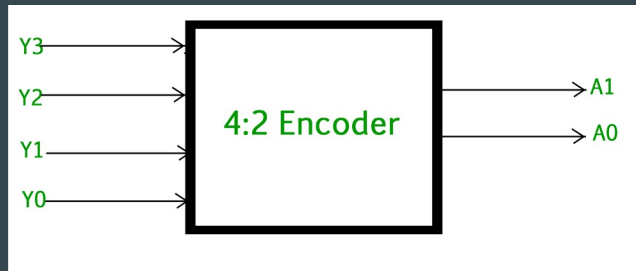
Total switch = 10(From switch 0 to switch 9)

If none of the switches are pressed, the LED should be off.



Encoder

- Used to convert decimal numbers into binary (n-bit)
- Inputs = 2^n , outputs = n
- For example, a 4:2 encoder takes 4 inputs and has 2 outputs
- Input Y0 can be represented in 00, input Y2 can be represented in 01 .. and so on



INPUTS				OUTPUTS	
Y3	Y2	Y1	Y0	A1	A0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

Boolean Expression for a 4:2 Encoder

Here,

- $A1 = Y3 + Y2$
- $A0 = Y3 + Y1$

For example, if Y2 is set,

Then $A1 = 0+1 = 1$ and $A0 = 0+0 = 0$

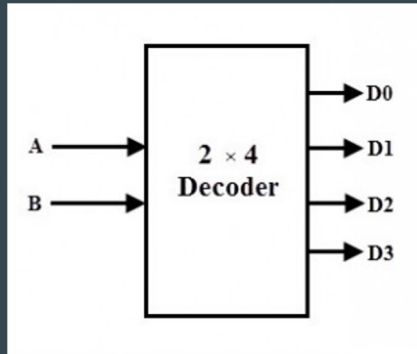
So, Output = 10

INPUTS				OUTPUTS	
Y3	Y2	Y1	Y0	A1	A0
0	0	0	1	0	0
0	0	1	0	0	1
0	1	0	0	1	0
1	0	0	0	1	1

For this Problem, we have 10 cars. So you need an encoder that supports that.

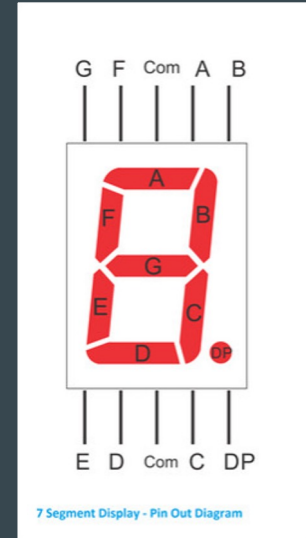
Decoder

- It does exact opposite of the encoder, so take n inputs and produces 2^n outputs
- For example as a 2 to 4 decoder, it takes 2 bit inputs, and produce 4 outputs
- e.g) 01 \rightarrow 0010(1)
- How to produce boolean expressions for decoder?



7 segment display

- Develop the truth table of 7 segment display
- Build boolean expressions for all the inputs.



Problem 2 Todos

- Write some short answers(Report)
- Understand 7-segment display
- Design the system using Encoder and Decoder(Demo)
- Add screenshots in your report and brief explanation of how it works(Report)

Thank You.

Any Questions??