Lab 1

1 Introduction

1.1 Target

- Know how to read datasheet.
- Design simple circuit with 74 familly.
- Optimize boolean expression by using boolean algebra and K-map.
- Know how to use VOM.

1.2 Contents

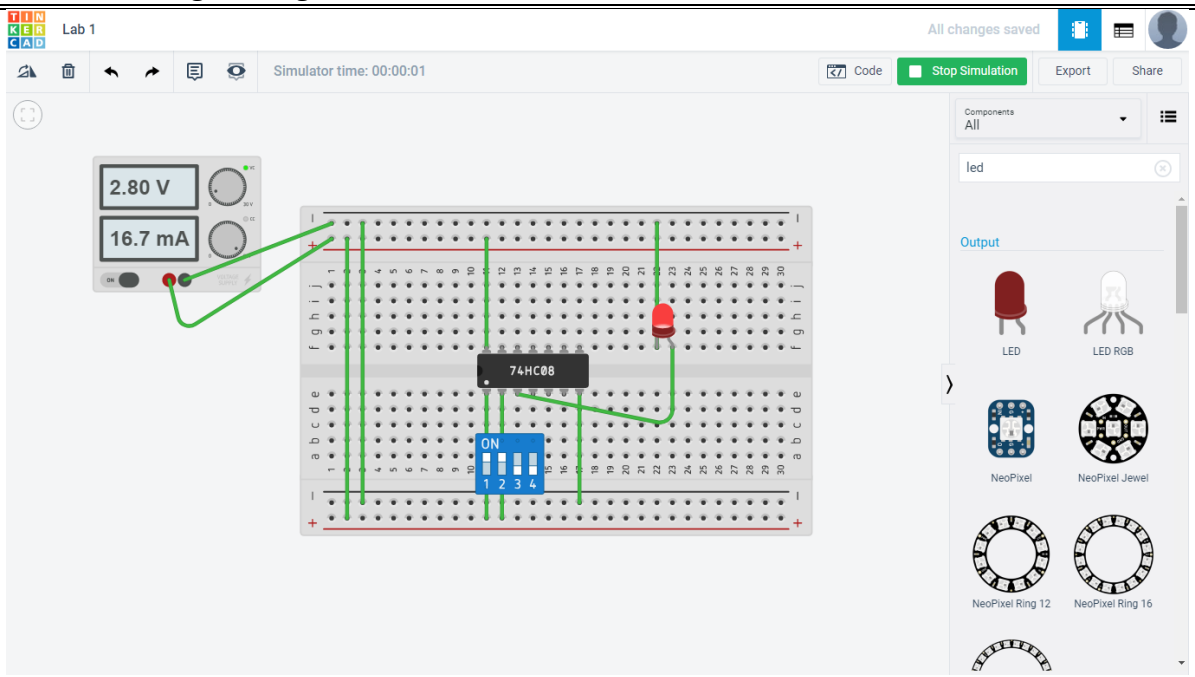
- Investigate some IC in 74 familly.
- Optimize boolean expression and implement it by using 74s IC.

2 Exercises

Note: Take pictures for every circuits that are implemented and attach its into your report.
Ex 1: Investigate the function of 2 in 6 IC that was mentioned. Sources of inputs are switch, destinations of outputs are LEDs. Draw your circuit and fill the two truth tables below.

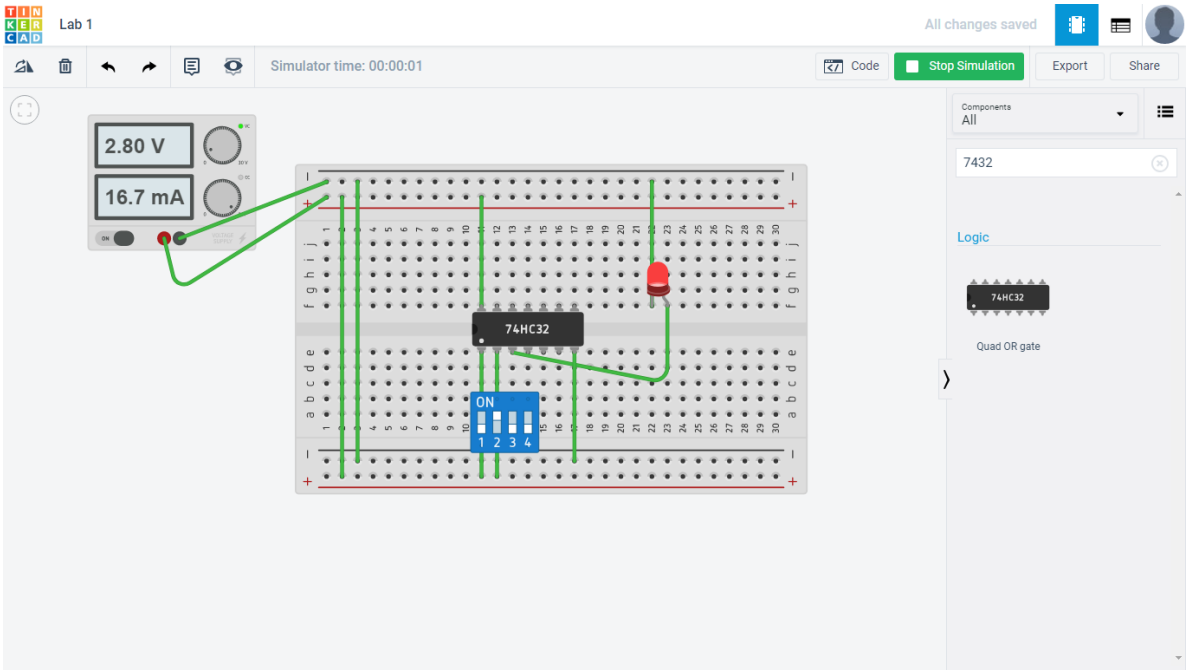
IC 7408: X = AB

Input 1	Input 2	Output
1	1	1
1	0	0
0	1	0
0	0	0



IC 7432: X = A + B

Input 1	Input 2	Output
1	1	1
1	0	1
0	1	1
0	0	0



Ex 2: Optimize these expressions below by using bolean algebra for x, K-map for z. Present each step which you do in the report. Draw the circuit and implement your design.

- $x = \overline{A}BCD + A\overline{BCD} + A\overline{B}\left(\overline{\overline{C} + D}\right) + A\left(\overline{\overline{B} + C}\right)D + A\left(\overline{\overline{B + \overline{C} + \overline{D}} + B\overline{C}}\right) + ABC$

$= \overline{A}BCD + A\left(\overline{B} + \overline{C} + \overline{D}\right) + A\overline{B}C\overline{D} + A\overline{B}\,\overline{C}D + A\left(\overline{B}CD + B\overline{C}\right) + ABC$

$= \overline{A}BCD + A\left(\overline{B} + \overline{C} + \overline{D}\right) + \left(A\overline{B}C\overline{D} + A\overline{B}CD\right) + A\overline{B}\,\overline{C}D + \left(AB\overline{C} + ABC\right)$

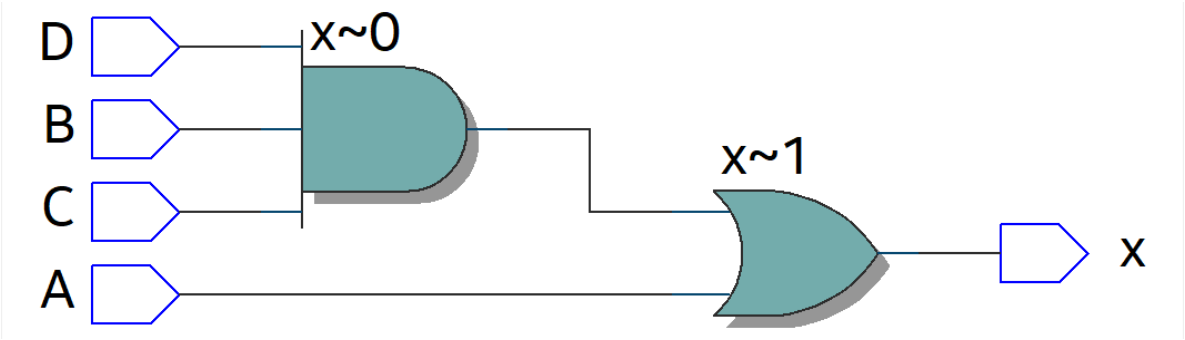
$= \overline{A}BCD + A\left(\overline{B} + \overline{C} + \overline{D}\right) + A\overline{B}C + A\overline{B}\,\overline{C}D + AB$

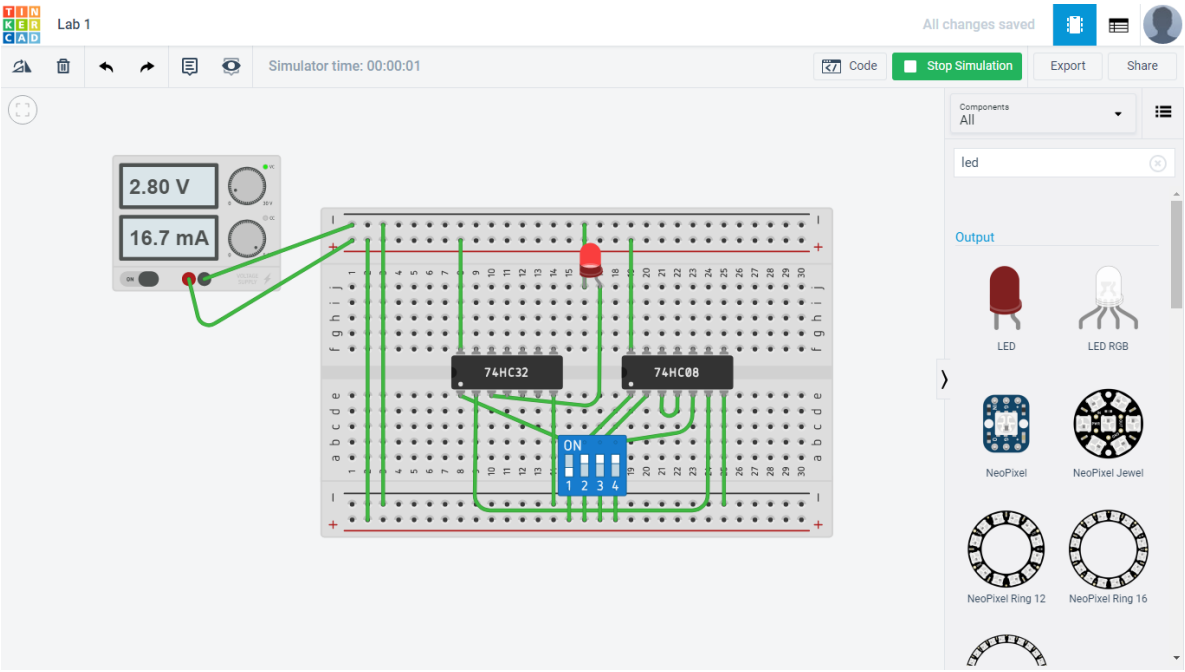
$= \overline{A}BCD + A\left(B + \overline{B} + \overline{C} + \overline{D} + \overline{B}C + \overline{B}\,\overline{C}D\right)$

$= \overline{A}BCD + A\left(1 + \overline{C} + \overline{D} + \overline{B}C + \overline{B}\,\overline{C}D\right)$

$= \overline{A}BCD + A.1$

$= A + BCD$





- $z = (M + N)(\overline{M} + P)(\overline{N} + \overline{P})$

$= (M\overline{M} + MP + N\overline{M} + NP)(\overline{N} + \overline{P})$

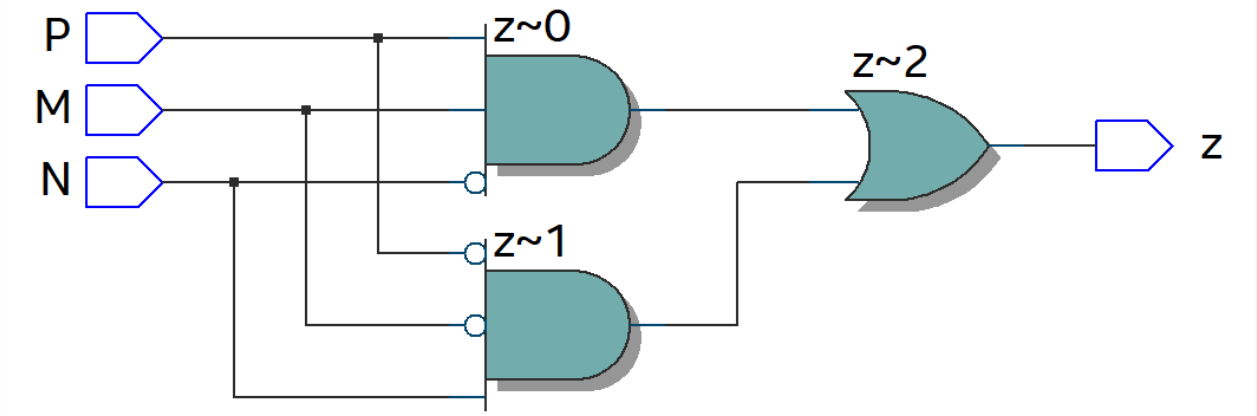
$= M\overline{M}\,\overline{N} + MP\overline{N} + \overline{M}N\overline{N} + N\overline{N}P + M\overline{M}\,\overline{P} + MP\overline{P} + \overline{M}N\overline{P} + NP\overline{P}$

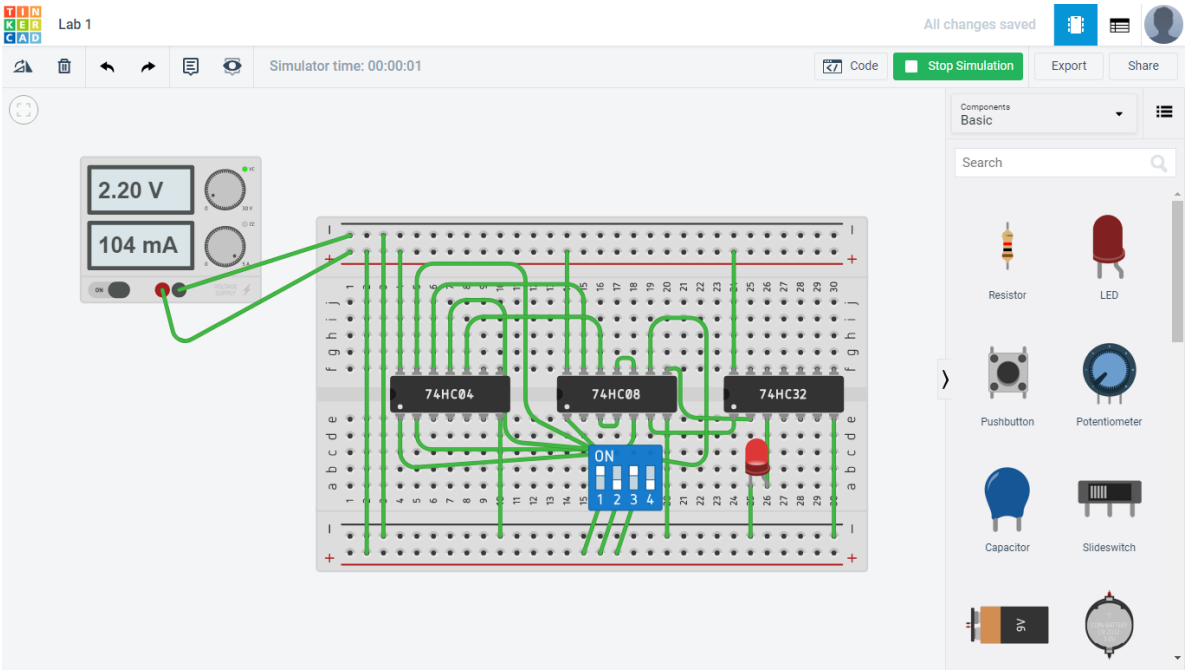
$= 0 + M\overline{N}P + 0 + 0 + 0 + 0 + \overline{M}N\overline{P} + 0$

$= M\overline{N}P + \overline{M}N\overline{P}$

K-Map:

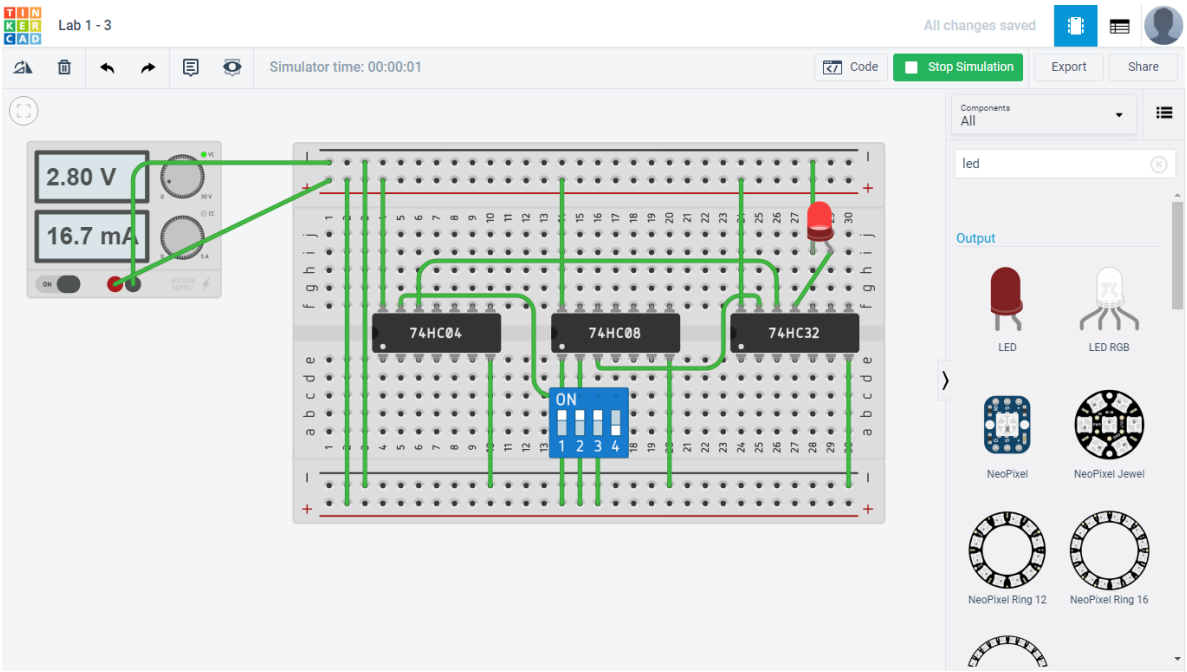
	$\boldsymbol{P}$	$\boldsymbol{\overline{P}}$
$\boldsymbol{\overline{M}\,\overline{N}}$	0	0
$\boldsymbol{\overline{M}N}$	0	1
$\boldsymbol{M\overline{N}}$	1	0
$\boldsymbol{MN}$	0	0



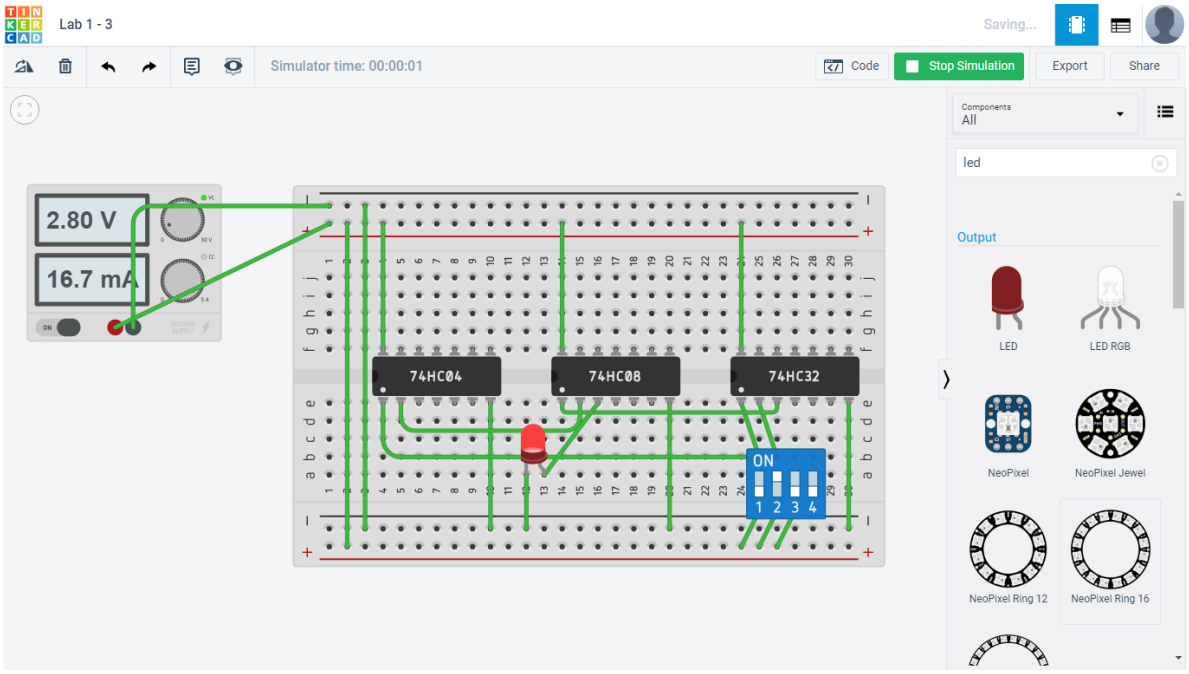


Ex 3: Use 7404s, 7408s, 7432s to implement these boolean expressions below. Draw your circuit and fill the truth table below.

- $x = AB + \overline{C}$



- $y = (A + B)\overline{C}$



A	B	C	x	y	z
1	1	1	1	0	
1	1	0	1	1	
1	0	1	0	0	
1	0	0	1	1	
0	1	1	0	0	
0	1	0	1	1	
0	0	1	0	0	
0	0	0	1	0	