Department of Computer Science and Information Engineering

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數位系統實驗

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LAB - 02

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Three representations for a circuit

1. Boolean Algebra

$$F1 = x + y'z$$

2. Truth Table 真值表

output variables   2n combinations

Inputs

3. Circuit Diagram
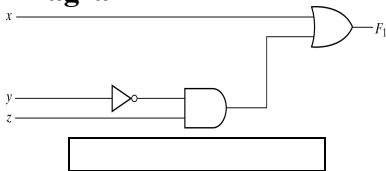
Equipment

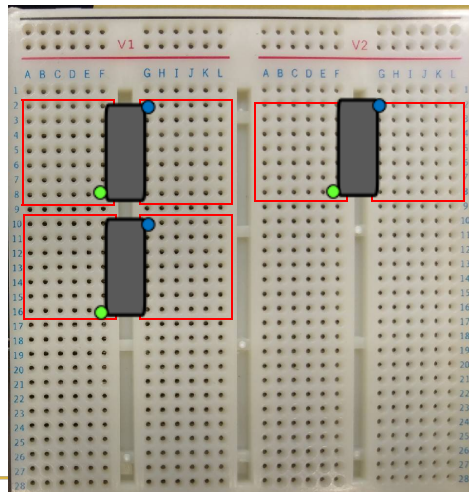| Names	Amount
Solerless Breadboard	×1
74LS00	×1
74LS04	×1
74LS08	×1
74LS32	×1

Lab notice

- **Input**
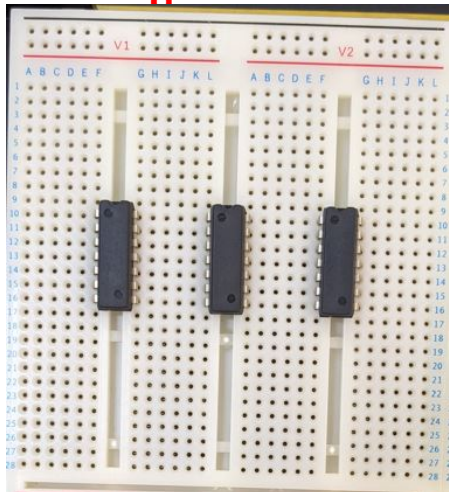

- **Output**

Lab notice

Correct
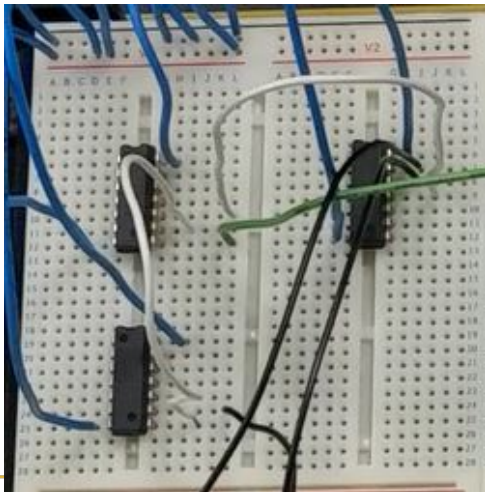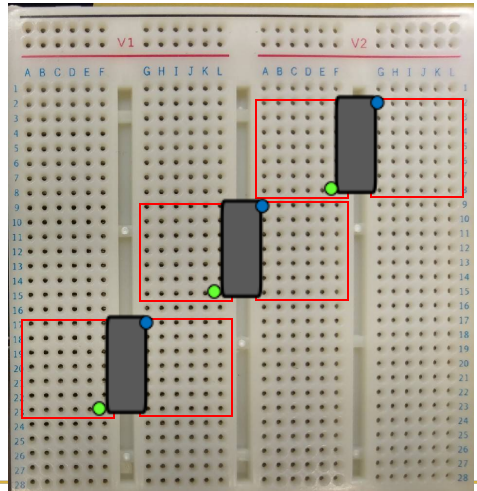
VCC : ●   GND : ●
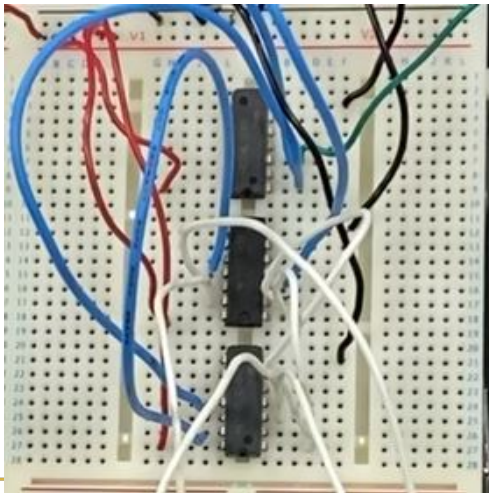
Lab notice

Wrong

Overlap
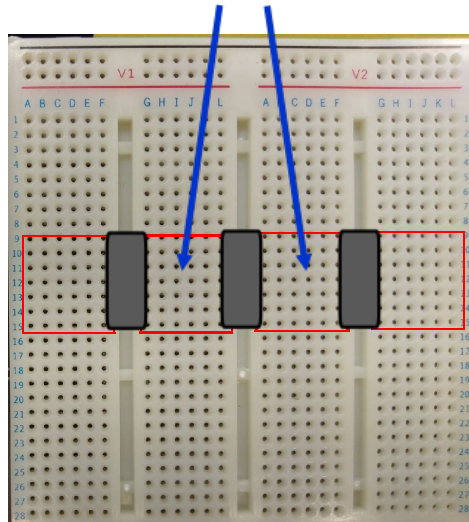
Lab notice

Correct
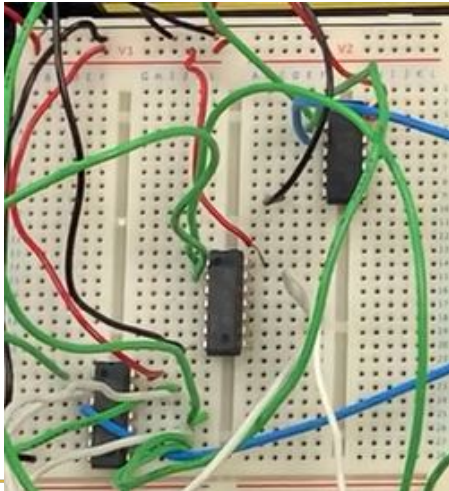
VCC ： ●   GND ： ●

Lab notice

Correct

VCC : ● GND : ●
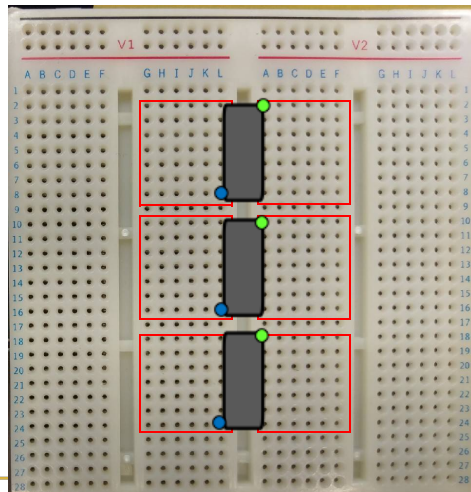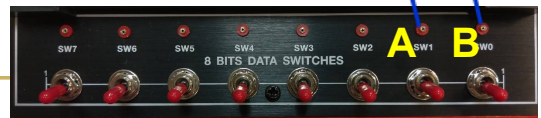
Lab notice

Lab notice

Lab 02_1

- **Please draw their Truth Tables and implement the circuits with breadboard.**

2-1-1 • **F1(A, B) = (A + B)'(A' + B')**

2-1-2 • **F2(A, B) = A'+ AB**

A	B	F1
0	0	1
0	1	0
1	0	0
1	1	0

A	B	F2
0	0	1
0	1	1
1	0	0
1	1	1

Lab 02_2 - Half Adder (1/2)

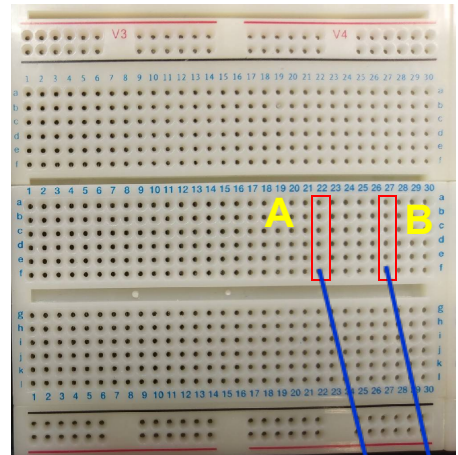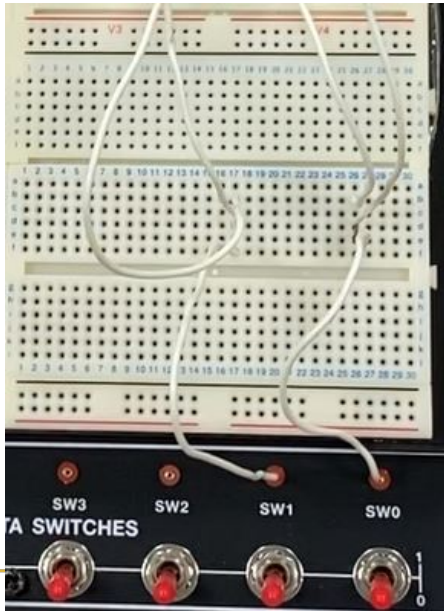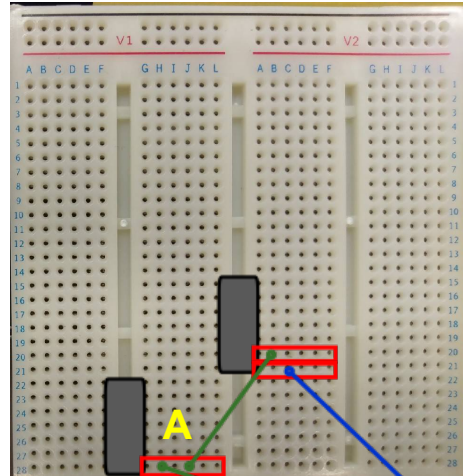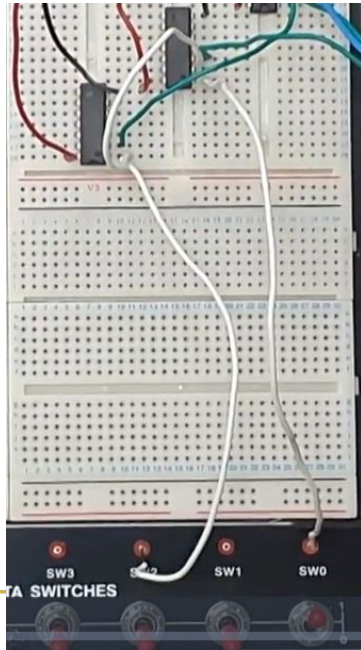- A half adder (HA) consists of two inputs (A and B) and two outputs (Sum and Carry). "A" denotes the summand and "B" is the addend. Sum and Carry mean the output sum and carry for input "A" and "B". The truth table and Boolean algebra for the half adder are as follows.

A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$$\text{Carry} = A \cdot B$$

$$\text{Sum} = \overline{A} \cdot B + A \cdot \overline{B}$$

F(A, B) = A'B' + A'B + AB' + ~~AB~~

Lab 02_2 - Half Adder (2/2)

Please

(a) draw the circuit diagram of the half adder according to the truth table shown in previous page.

(b) implement the circuit on the breadboard.

- **There are two inputs denoted as A and B. Both A and B are 1-bit value. A comparator is designed to determine whether A is equal to B or not. The output results are represented with E .**

- **The function and truth table of the comparator is described as follows.**

$$E = \begin{cases} 1 & , if\ A\ is\ equal\ to\ B \\ 0 & ,\ else \end{cases}$$

Lab 02_3 – Comparator(2/2)

Please

   (a) draw the truth table of the comparator.

   (b) draw the circuit diagram of the comparator.

   (c) implement the circuit on the breadboard.

A	B	F
0	0	1
0	1	0
1	0	0
1	1	1

$F(A, B) = (A'B') + (AB)$

$F(A, B) = A'B' + A'B + AB' + AB$