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DIGITAL ELECTRONICS LAB WORKSHEET

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CLASS: 215-A

UID: 21BCS2062

DATE OF PERFORMANCE: 18 MARCH 2022

SUBJECT: DIGITAL ELECTRONICS

EXP NO: 1.4

AIM: DESIGN AND REALIZE A GIVEN FUNCTION USING K-MAPS AND VERIFY ITS PERFORMANCE.

TASK TO BE DONE:

1. We connect the power supply with the breadboard with the help of wires.

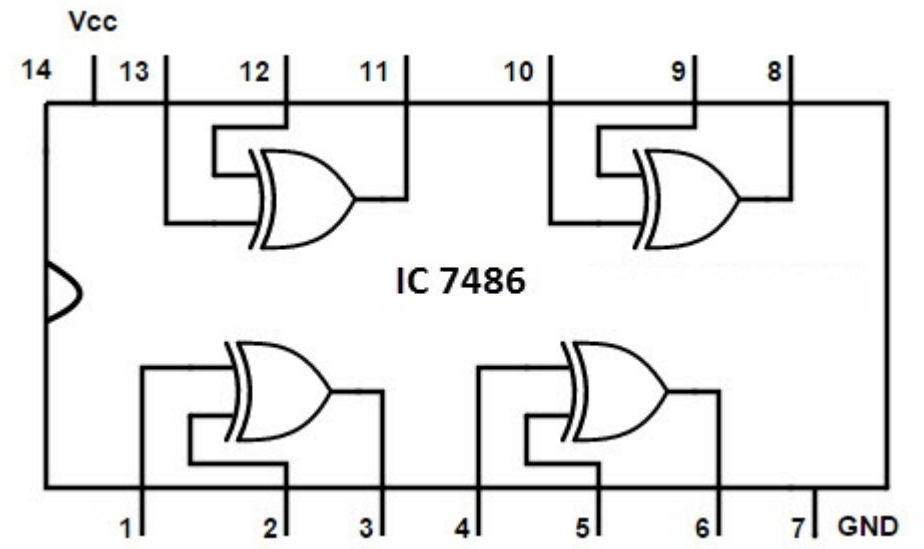
2. We use various gates and provide the desired inputs in order to receive the output.

3. We then verify the truth table for each input/output combinations.

4. We gently start the stimulation. And stop the stimulation when the required output is obtained.

REQUIREMENTS: 7486 (XOR) IC, 5V Power Supply, Breadboard, Connecting wires, Simulation software.

CIRCUIT DIAGRAM:



DESIGN:

Canonical Forms (Normal Forms):

Any Boolean function can be written in disjunctive normal form (sum of min-terms) or conjunctive normal form (product of max- terms). A Boolean function can be represented by a Karnaugh map in which each cell corresponds to a minterm. The cells are arranged in such a way that any two immediately adjacent cells correspond to two minterms of distance 1. There is more than one way to construct a map with this property.

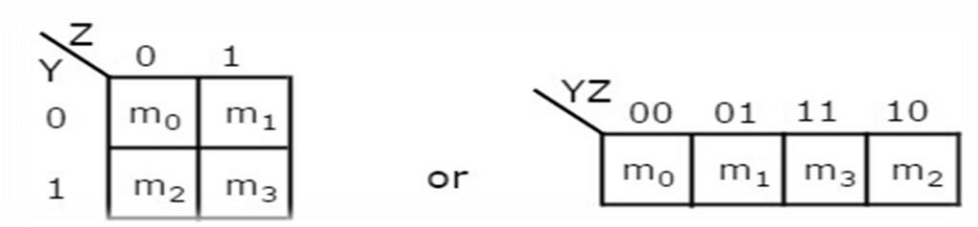
Karnaugh Maps

2-Variable K-Map

The number of cells in 2 variables K-map is four, since the number of variables is two. The following figure shows 2 variables K-Map.

There is only one possibility of grouping 4 adjacent min terms.

The possible combinations of grouping 2 adjacent min terms are {(m0, m1), (m2, m3), (m0, m2) and (m1, m3)}.



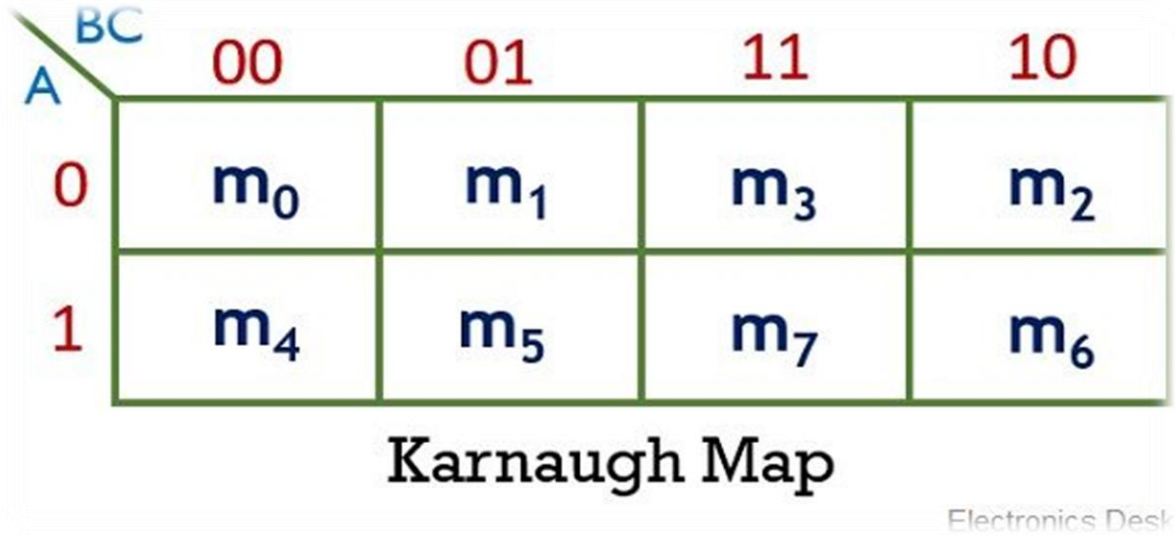
3-Variable K-Map

The number of cells in 3 variable K-map is eight, since the number of variables is three. The following figure shows 3 variable K-Map.
There is only one possibility of grouping 8 adjacent min terms

The possible combinations of grouping 4 adjacent min terms are {(m0, m1, m3, m2), (m4, m5, m7, m6), (m0, m1, m4, m5), (m1, m3, m5, m7), (m3, m2, m7, m6) and (m2, m0, m6, m4)}.

The possible combinations of grouping 2 adjacent min terms are {(m0, m1), (m1, m3), (m3, m2), (m2, m0), (m4, m5), (m5, m7), (m7, m6), (m6, m4), (m0, m4), (m1, m5), (m3, m7) and (m2, m6)}.

If x=0, then 3 variable K-map becomes 2 variable K-map.

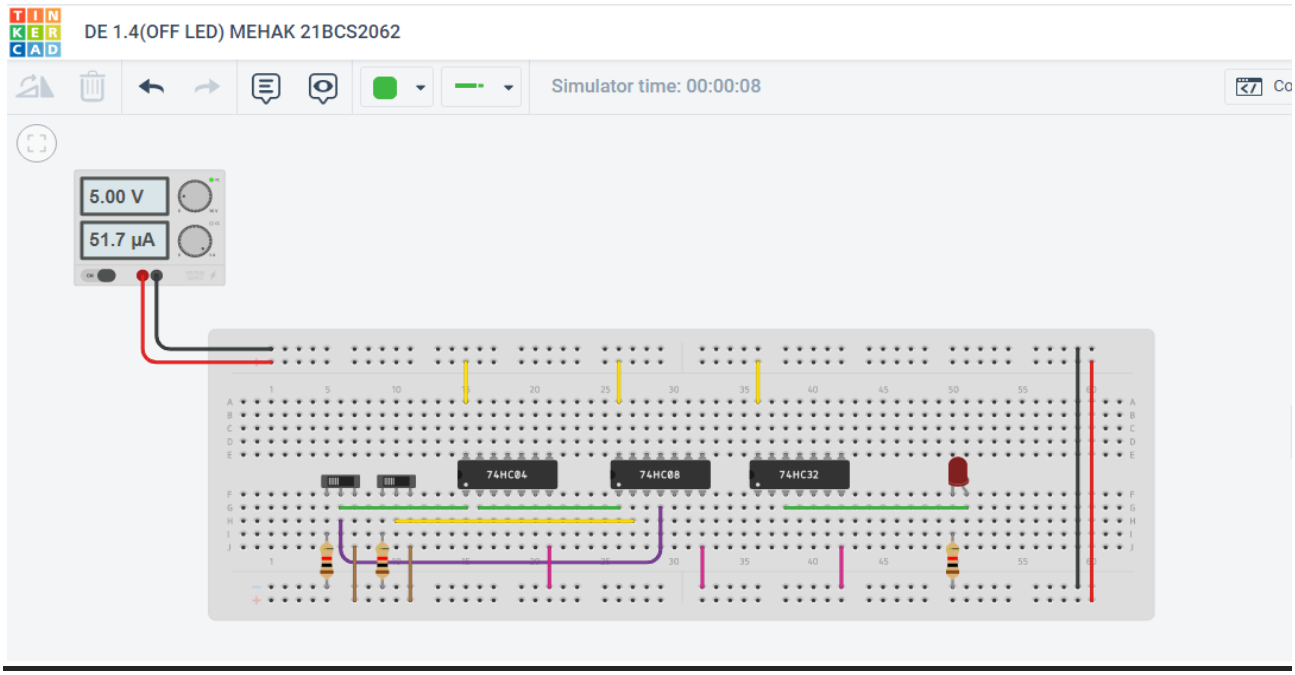


Four Variable K-Map

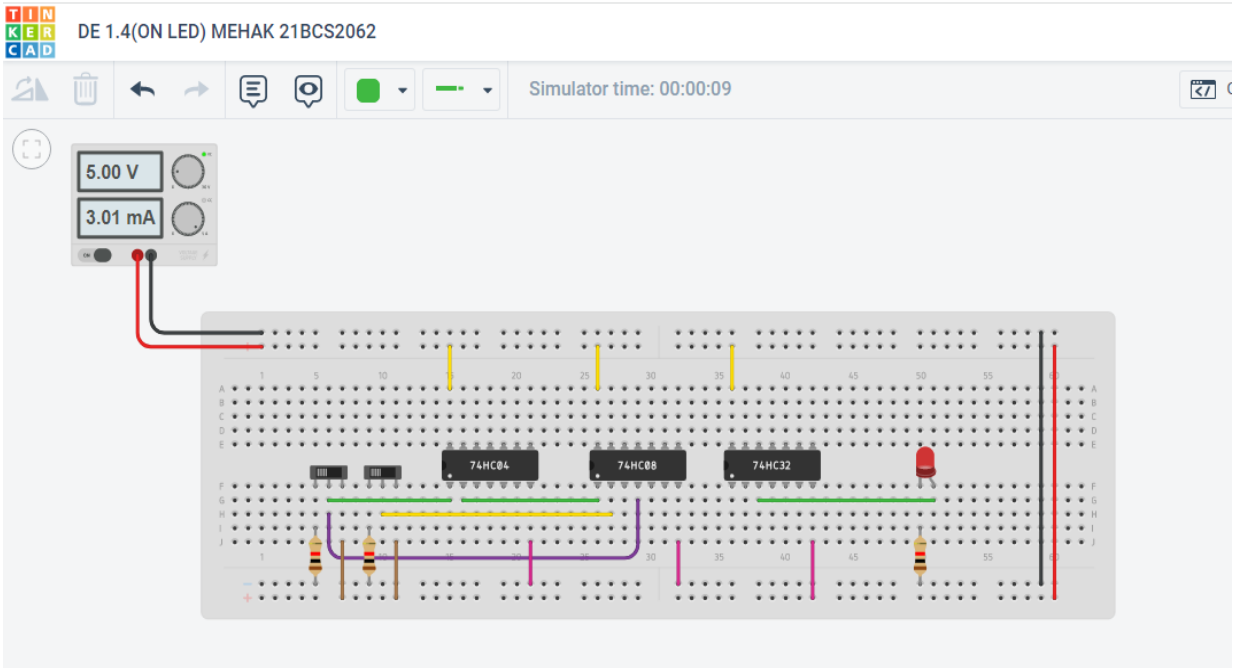
The number of cells in 4 variables K-map is sixteen, since the number of variables is four. The following figure shows 4 variables K-Map.

STIMULATION RESULTS:

When both the switches are off(OFF LED):



When one switch is on and other is off(ON LED):



CONCEPT USED:

Using the karnaugh map we were able to identify and design the circuit. The basic concept of logic gates for forming the truth table. We now use the knowledge of K-mapping in order to check various logic gates and their validation.

OBSERVATION:

We were able to identify different types of digital circuits and their difference and to illustrate the various types of gates.

By performing this worksheet, we learnt about:

1. The application of AND, OR, NOT gate in order to form XOR gate.

2. Designing a given function with the basic knowledge of K-map and verifying it.

RESULT:

Using the concept of karnaugh map we were able to design circuit using 3 different IC and were able to know their outcomes.