IMPLEMENTATION OF FULL ADDER AND FULL SUBTRACTOR USING LOGIC GATES

Objective:

To realize the operation of adder and subtractor circuit using basic logic gates.

LIST OF MAJOR EQUIPMENTS:

Sl No.	Name	Manufacturer	Model No	Specification
1.	Power Supply	ELNOVA/ Aplab	E-61	S1:0-30V, S2:0-2V, S3:5V,5A
2.	Logic Probe	Made in Taiwan	Model-625	50 MHz freq. range

Theory:

A combinational circuit that performs the addition of 2 bits is called the half adder. One that performs the addition of three bits is called a full adder.

A half adder has 2 inputs and 2 outputs. The output variables produce the sum and carry.

In full adder two input variables A and B represents the two significant bits to be added. The third input C represents the carry from the previous lower significant position. It has two outputs sum and carry.

A half sub tractor is a combinational circuit that subtracts two bits. It has two inputs and two outputs. The output variables produce difference and borrow. A full subtractor is a combinational circuit that performs subtraction between two bits taking into account one may have been borrowed by a lower significant stage. It has three inputs and two outputs.

TRUTH TABLE FOR HALF ADDER AND HALF SUBTRACTOR:

HALF ADDER HALF SUBSTRACTOR

A	B	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

A	B	DIFF	Borrow
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

TRUTH TABLE FOR FULL ADDER AND FULL SUBTRACTOR:

OBSERVATION TABLE FOR HALF ADDER AND HALF

A	B	C	SUM	CARRY	DIFF	BORROW
0	0	0	0	0	0	0
0	0	1	1	0	1	1
0	1	0	1	0	1	1
0	1	1	0	1	0	1
1	0	0	1	0	1	0
1	0	1	0	1	0	0
1	1	0	0	1	0	0
1	1	1	1	1	1	1

SUBTRACTOR:

HALF ADDER

A	B	SUM	CARRY
L	L	L	L
L	H	H	L
H	L	H	L
H	H	L	H

HALF SUBTRACTOR

A	B	DIFF	Borrow
L	L	L	L
L	H	H	H
H	L	H	L
H	H	L	L

OBSERVATION TABLE FOR FULL ADDER AND FULL SUBTRACTOR:

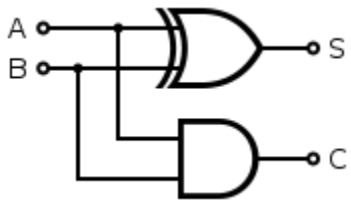
FULL ADDER

A	B	C	SUM	CARRY
L	L	L	L	L
L	L	H	H	L
L	H	L	H	L
L	H	H	L	H
H	L	L	H	L
H	L	H	L	H
H	H	L	L	H
H	H	H	H	H

FULL SUBTRACTOR

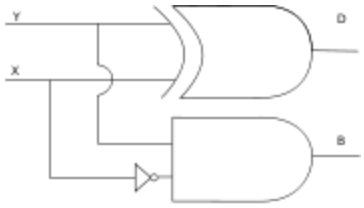
A	B	Cin	DIFF	Borrow
L	L	L	L	L
L	L	H	H	H
L	H	L	H	H
L	H	H	L	H
H	L	L	H	L
H	L	H	L	L
H	H	L	L	L
H	H	H	H	H

CIRCUIT DIAGRAM



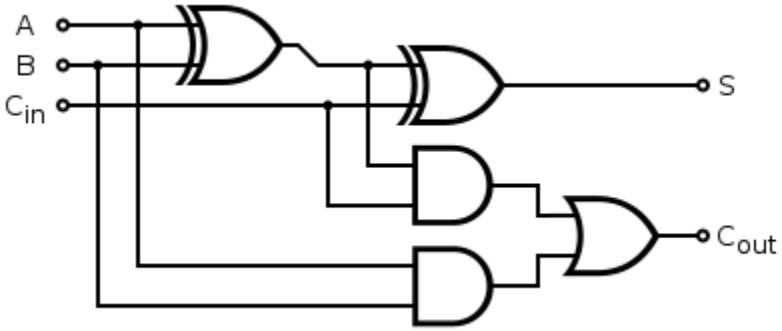
HALF ADDER

NOTE: give the Boolean expression for SUM and CARRY by yourself.



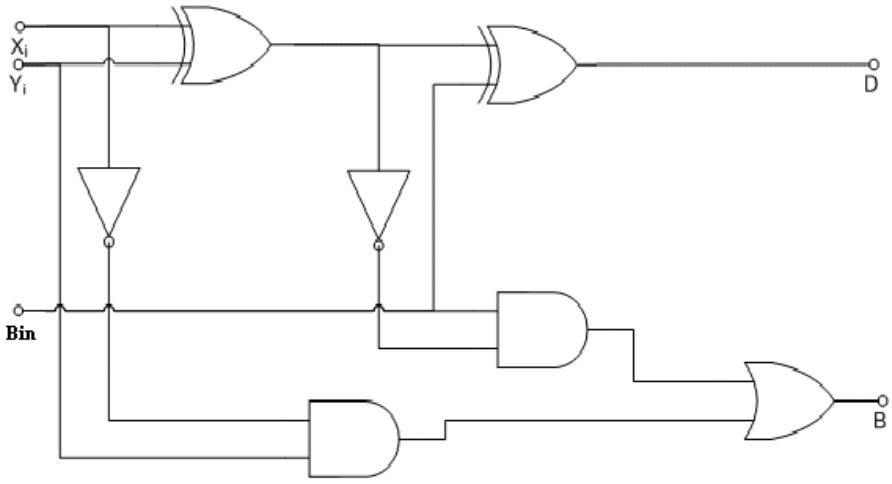
HALF SUBTRACTOR

NOTE: give the Boolean expression for DIFFERENCE and BORROW by yourself.



FULL ADDER

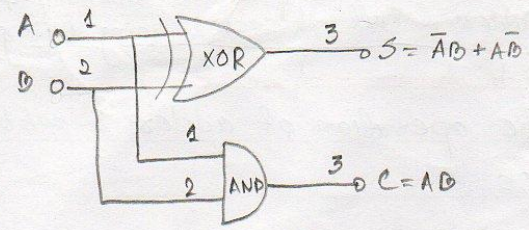
NOTE: give the Boolean expression for SUM and CARRY by yourself.



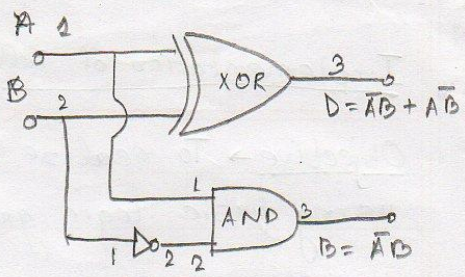
FULL SUBTRACTOR

NOTE: give the Boolean expression for DIFFERENCE and BORROW by yourself.

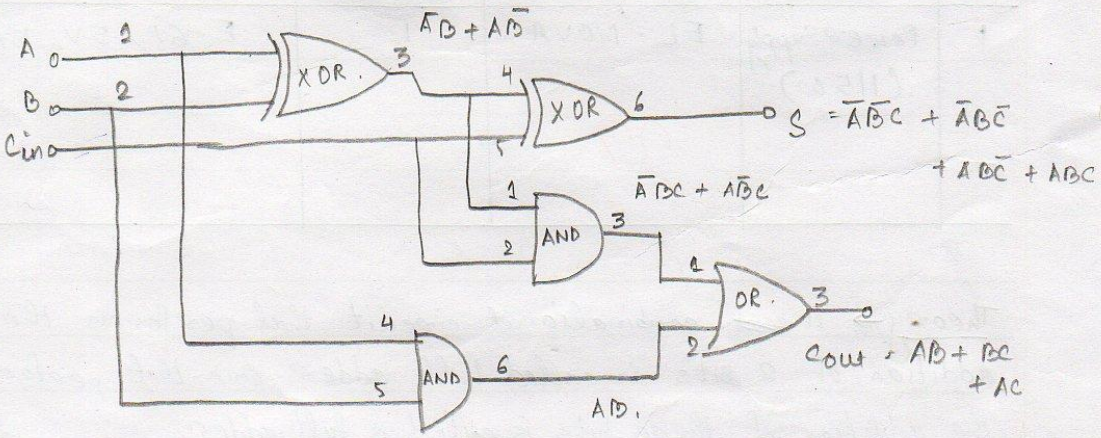
CIRCUIT DIAGRAM



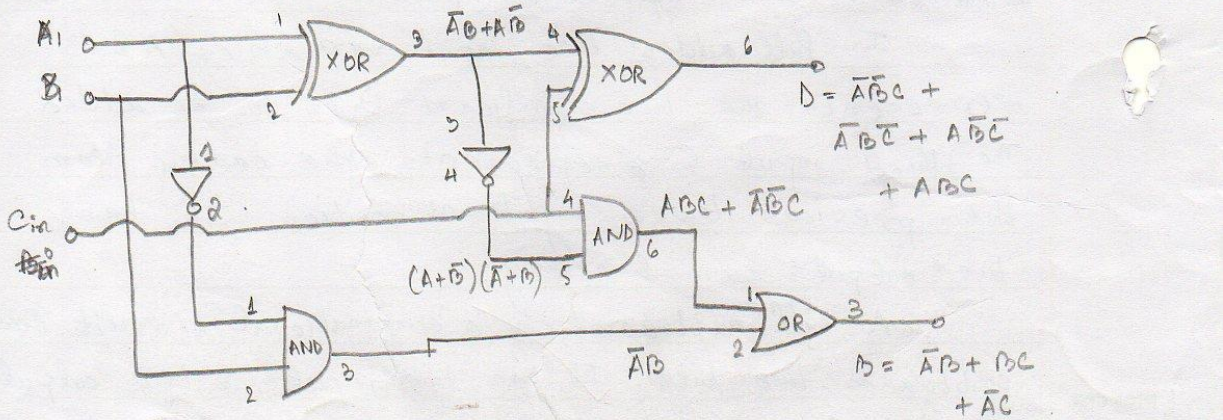
HALF ADDER.



HALF SUBTRACTOR



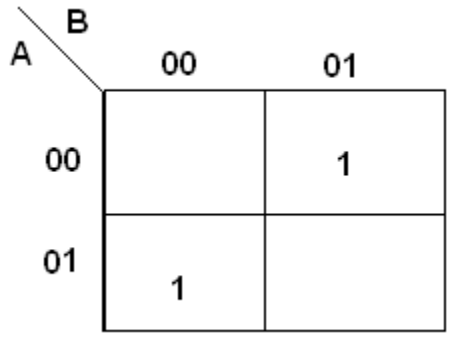
Full Adder.



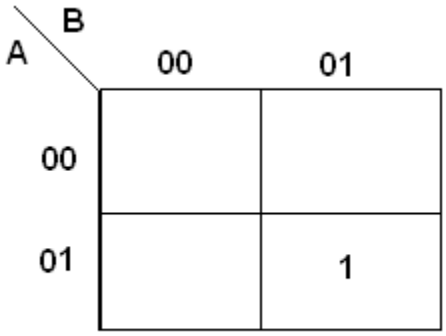
Full Subtractor

For Half Adder

K-Map for SUM:



K-Map for CARRY:

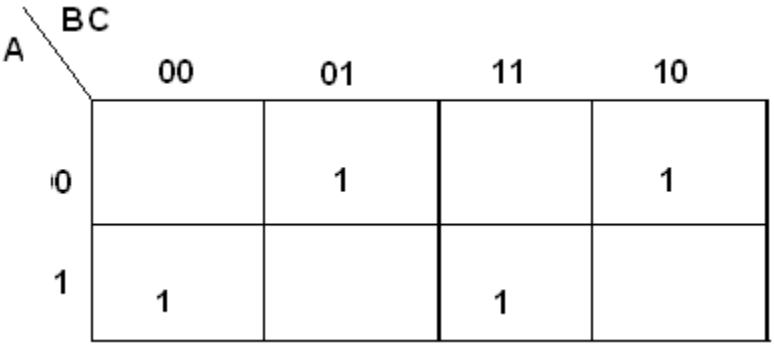


SUM = A'B + AB'

CARRY = AB

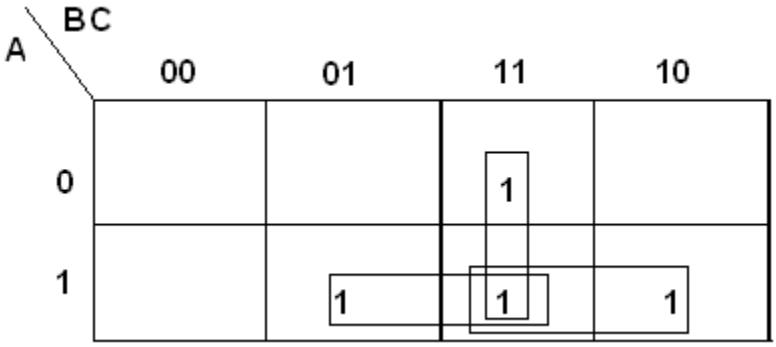
For Full Adder

K-Map for SUM:



SUM = A'B'C + A'BC' + ABC' + ABC

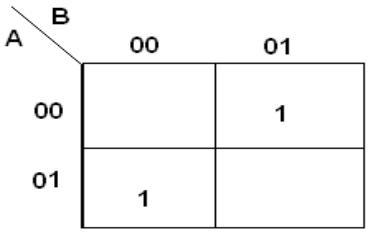
K-Map for CARRY:



CARRY = AB + BC + AC

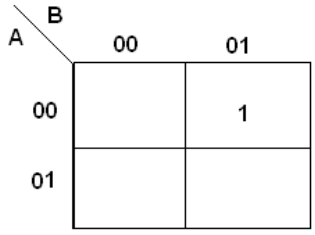
<u>For Half Subtractor</u>

K-Map for DIFFERENCE:



DIFFERENCE = A'B + AB'

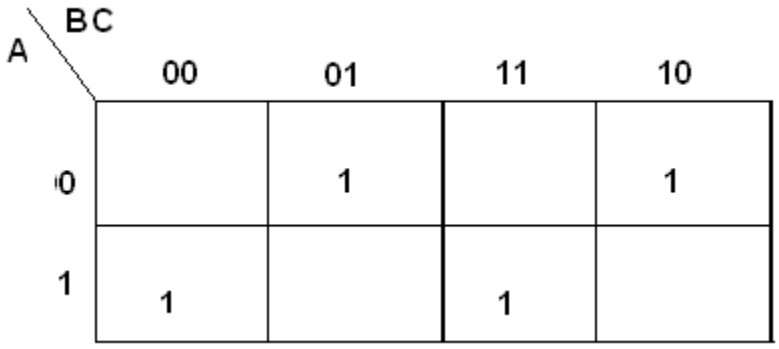
K-Map for BORROW:



BORROW = A'B

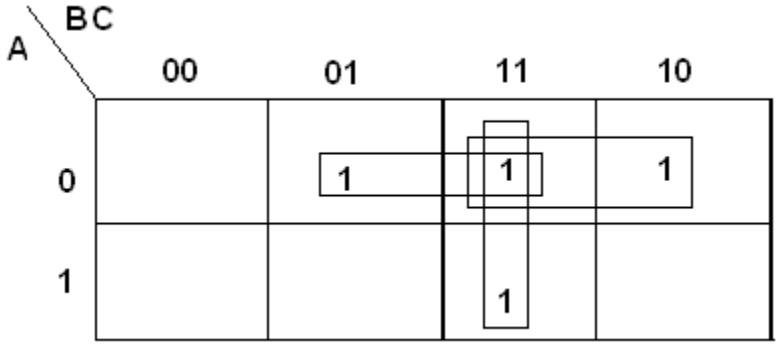
For full Subtractor

K-Map for Difference:



Difference = A'B'C + A'BC' + AB'C' + ABC

K-Map for Borrow:



Borrow = A'B + BC + A'C

CONCLUSSION:

NOTE: Here are some Questions. You need not write the questions , You only write the answers

1. Can we construct a full adder and full subtractor circuit using universal gates.
2. What are the uses of full adder and full subtractor circuit