MEDI-CAPS UNIVERSITY, INDORE			
Department of Electronics Engineering		Lab Session No.	Page No.
Digital Electronics	Enrol. No.		Batch No.

Performance Evaluation:

Name							
Performing on		First Submission	Second Submission				
Extra	regular						
Grade and Remarks by the Tutor							
1.	Clarity about the objective of the experiment						
2.	Clarity about the problem statement						
3.	Submitted the work in desired format						
4.	Shown capability to solve the problem						
5.	Contribution to the team work.						
Others:							
Grade	A	B	C	D	F	Signature	

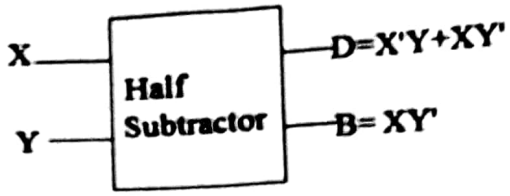
Experiment No. 4

1. **TITLE: IMPLEMENTATION OF HALF SUBTRACTOR AND FULL SUBTRACTOR CIRCUITS.**

2. **AIM:** Implementation of half subtractor and full subtractor circuits.
   a. To understand Binary subtraction using subtractor
   b. Implementation of subtractor using logic gates.
   c. To learn about the combinational circuits.

3. **Objective**: After performing this experiment students will be able to understand:
   a. The concept of binary subtraction and its utility.
   b. The utility of logic gates to implement half subtractor, full subtractor
4. **Problem statement:**
   a. To design the circuit of sub-tractor using IC7408,7404,7432,7486
   b. Perform the subtraction operation using these circuits.
5. **Apparatus required:**
   a. Prototyping board (Bread board).
   b. DC power supply 5V battery.
   c. Light Emitting Diodes (LED's).
   d. Digital IC's: 7486 Quad 2 input XOR gate, 7408 Quad 2 input AND gate, 7404 Hex NOT gates (Inverter), 7432 Quad 2 input OR gate.
   e. Connecting wires.

6. **Theory**
   Half Subtractor: A half subtractor is a combinational circuit that subtracts two bits and produces their difference. Designate the minuend bit by 'x' and the subtrahend bit by 'y'.



Block Diagram

The half subtractor has two outputs. One output generates the difference and will be designated by the symbol 'D'. The second output, designated 'B' for borrow generates the binary signal that informs the next stage that a 1 has been borrowed.

Truth Table for Half Subtractor:

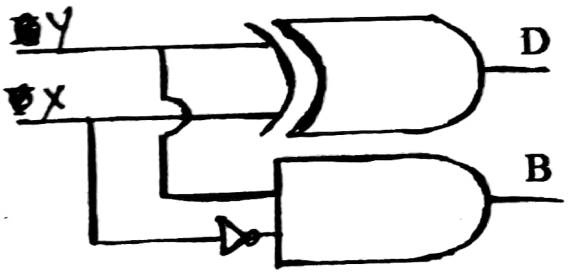
X	Y	B	D
0	0	0	0
0	1	1	1
1	0	0	1
1	1	0	0

Expression:

$$D = X \oplus Y$$

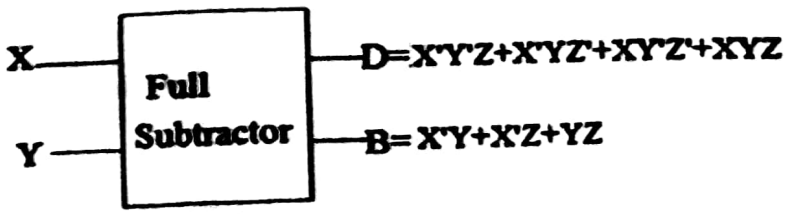
$$B = \overline{X} \bullet Y$$

Circuit Diagram:



Full subtractor:

A full subtractor is a combinational circuit that performs a subtraction between two bits, taking into account that a 1 may be borrowed by a lower significant stage. This circuit has three inputs and two outputs. The three inputs x, y, z



Block Diagram

denotes the minuend, subtrahend, and the previous borrow. The two outputs D and B represent the difference and borrow output respectively.

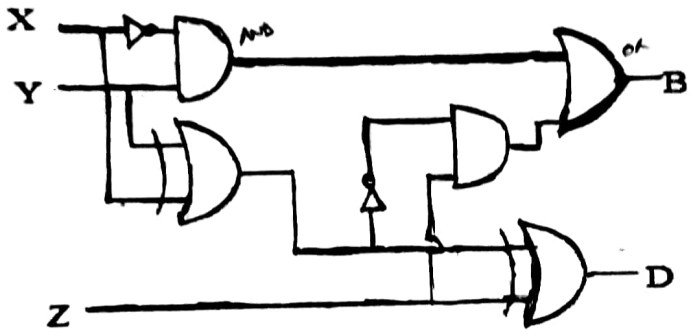
Circuit Diagram and Truth Table

X	Y	Z	B	D
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	0
1	0	0	0	1
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

Expressions:

Difference $D = \overline{X}\overline{Y}Z + \overline{X}Y\overline{Z} + X\overline{Y}\overline{Z} + XYZ = X \oplus Y \oplus Z$

Borrow $B = \overline{X}Y + \overline{X}Z + YZ$



7. Test Procedure:

a. Assemble the circuit of fig.1 on breadboard using IC s.
b. Give the logic inputs using 5V power supply.
c. Test the sum output S and carry output C for all combinations of inputs.
d. Make the truth table for the circuit.
e. Similarly repeat steps 1-4 for fig.

8. Result: (Write whether or not you have received the results as expected)

9. Self assessment:

a. How can we convert full adder into full subtract?
b. Implement the full subtractor with two half subtractor and an OR gate?

Prepared by	date	Modified on
		August 23, 2017