<u>Experiment - 7</u>

* <u>Aim :-</u> to study the operation of a Full Subtractor.

* <u>Apparatus :-</u> Breadboard, connecting wires, power supply, IC 7408, IC 7432, IC 7480, IC 7404, LED Display board.

* <u>Theory :-</u> A full subtractor is a combinational circuit that performs the subtraction involving three bits. It has three inputs A, B and Bin and two outputs D (Difference) and Bout (Borrow out). It can be implemented by using two half subtractors.

* <u>Procedure :-</u>
1. Connect the IC on breadboard.
2. Give + 5 V to pin 14 and ground pin 7
3. Connect the input pins in A, B and Bin of IC from binary switches.
4. Connect output pins D and Bout of IC from LED.
5. Switch on the power supply and change the input combinations at every instant.
6. Verify the truth table.

* <u>Result :-</u> the truth table for Full Subtractor is verified.

* <u>Precautions :-</u>
1. Insert the IC carefully on the breadboard.
2. take care while supplying voltage to the IC.
3. Connections should be made according to the diagram.

```
A  ──────┐
         │  Full
B  ──────┤  Subtractor  ├──── D
         │
Bin ─────┘              ├──── Bout
```
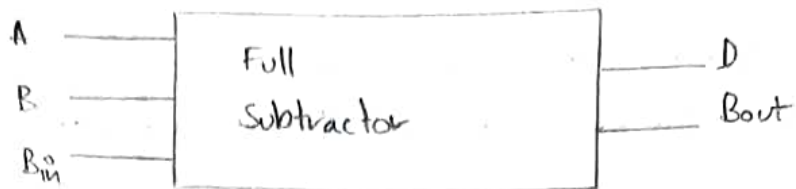
* Truth table

A	B	Bin	D	Bout
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	0	1

* K-Map for D (Difference)

A \ B Bin	00	01	11	10
0		(1)		(1)
1	(1)		(1)	

$$D = A\bar{B}\bar{B}_{in} + \bar{A}\bar{B}B_{in} + AB B_{in} + \bar{A}B\bar{B}_{in} = A \oplus B \oplus B_{in}$$

* K-Map for Bout (Borrow out)

$$B_{out} = \overline{A}B_{in} + BB_{in} + \overline{A}B$$
$$= \overline{A}B + B_{in}(\overline{A}+B)$$

* Circuit Diagram of Full Subtractor