Department of Computer Engineering

CLASS: S.E.COMP **SUBJECT :DEL**

EXPT. NO.:1 **DATE:**

TITLE : BINARY ADDER AND SUBTRACTOR CIRCUITS

OBJECTIVE :

1. Design and Implement Full adder circuit using basic gates and universal logic gates
2. Design and Implement Full Subtractor circuit using basic gates and universal logic gates

APPARATUS :

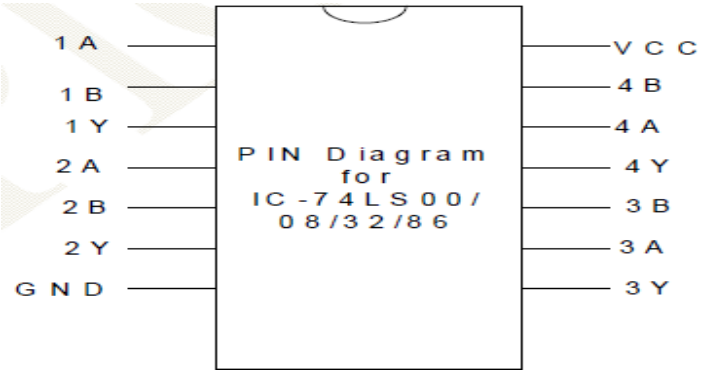
Digital-Board, GP-4Patch-Cords, IC-74LS86, IC-74LS32, IC-74LS08 / IC-74LS04 and IC-74LS00 and Required Logic gates if any.

THEORY :

Binary Adder and subtractor are a combinational logic circuit which is used to perform binary addition and subtraction .Full adder is a little more difficult to implement than a half-adder. The full-adder has three inputs and two outputs. The first two inputs are A and B and the third input is an input carry designated as CIN. When full adder logic is designed we will be able to string eight of them together to create a byte-wide adder and cascade the carry bit from one adder to the next

The full subtractor is a combinational circuit with three inputs A,B,C and two output D and C'. A is the 'minuend', B is 'subtrahend', C is the 'borrow' produced by the previous stage, D is the difference output and C' is the borrow output.

PIN DIAGRAM:



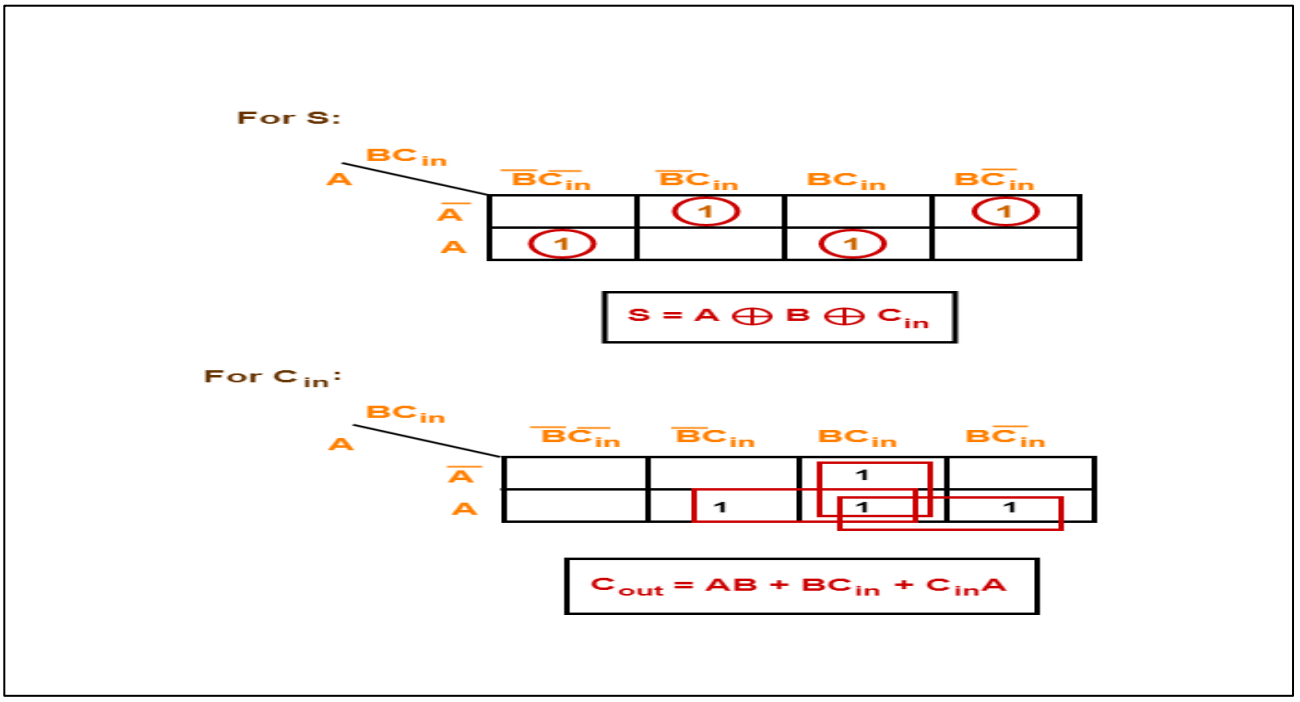
PROCEDURE :

1. Make the connections as per the Logic circuit of Full adder circuit and Verify its Truth Table.
2. Make the connections as per the Logic circuit of Full subtractor circuit and Verify its Truth Table

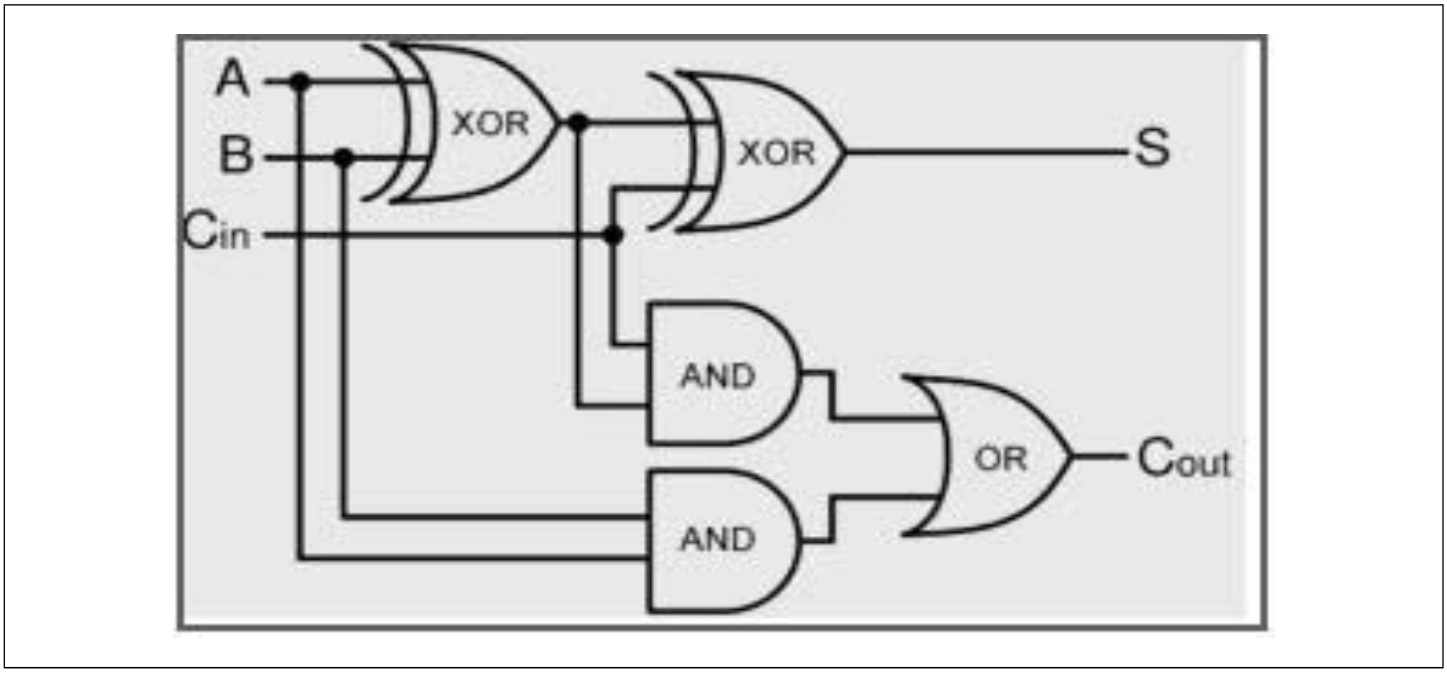
Truth Table of Full adder circuit

Dec.Equ.	INPUT			OUTPUT	
	A	B	Cin	Sum	Carry
0	0	0	0	0	0
1	0	0	1	1	0
2	0	1	0	1	0
3	0	1	1	0	1
4	1	0	0	1	0
5	1	0	1	0	1
6	1	1	0	0	1
7	1	1	1	1	1

K-Map Simplification for Sum and Carry



Logic Diagram:

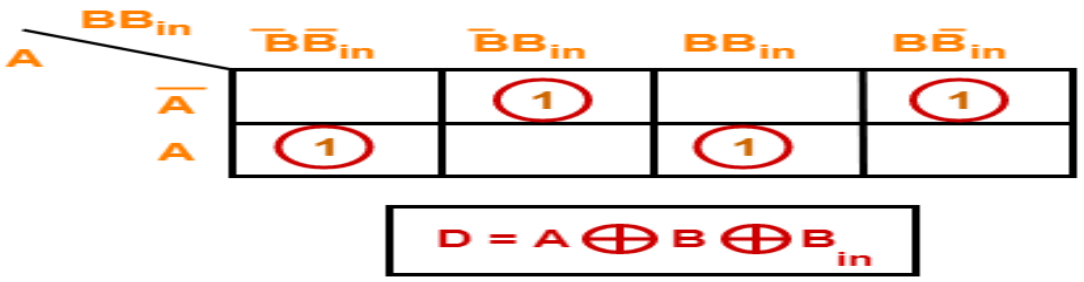


Design of Full subtractor circuit

Dec. Equ.	INPUT			OUTPUT	
	A	B	Cin	Difference	Borrow
0	0	0	0	0	0
1	0	0	1	1	1
2	0	1	0	1	1
3	0	1	1	0	1
4	1	0	0	1	0
5	1	0	1	0	0
6	1	1	0	0	0
7	1	1	1	1	1

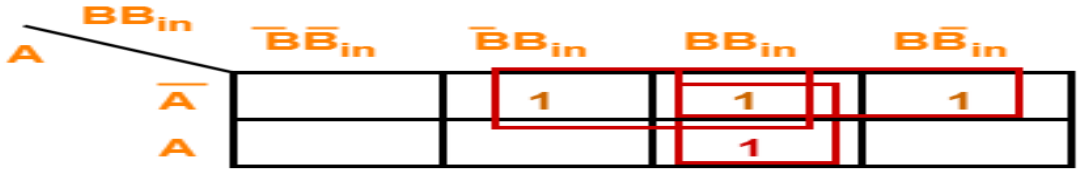
K-Map Simplification for Difference and Borrow

For D:



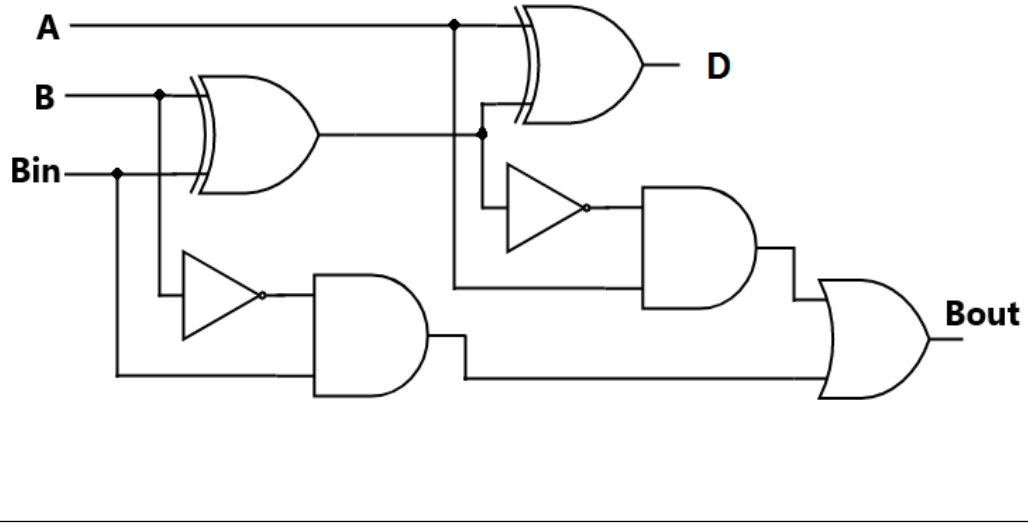
$$D = A \oplus B \oplus B_{in}$$

For B_{in}:



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

Logic Diagram:



Outcome:

After completion student will be able to understand working of full adder and full subtractor and design and implement the circuit by choosing appropriate ICs

REFERENCE:

1. **R.P.Jain "Modern Digital Electronics" TMH 4th Edition**
2. **D.Leach,Malvino,Saha,"Digital Principles and Applications",TMH**