CLASS :   S.E. 5 E &TC   **SUBJECT : DC**

EXPT. NO. : 3   **DATE :30/10/2020**

Roll No: 22119

TITLE   :   BCD ADDER.

PRE-REQUISTITES
FOR EXPT.   :   Rules of BCD Addition, Invalid conditions in BCD addition, Operation of BCD Adder using IC-74LS83.(Refer Data-Sheet)

OBJECTIVE   :

1. Design and Implement the 4 bit Binary Adder using IC-74LS83.
2. Design and Implement the 4 bit Binary subtractor using IC-74LS83. (for Positive & Negative Result)
3. Design and Implement the 4 bit Binary Adder/ sub tractor with mode control M using IC-74LS83. (for Positive & Negative Result)
4. Design and Implement the single digit BCD Adder using IC-74LS83.
5. Design and Implement 9's Complement circuits using IC 74LS83.
6. Design and Implement BCD Subtractor circuit using IC 74LS83

APPARATUS   :

Digital-Board, GP-4Patch-Cords, IC-74LS83, IC-74LS32, IC-74LS00 / IC-74LS04/IC`-74LS08, IC-74LS86.

THEORY   :

IC 74LS83 is a 4-bit binary parallel adder. By using 74LS83 we can implement BCD adder. BCD means Binary coded Decimal. BCD numbers are valid from 0 to 9. For BCD adder when addition is below 9, carry is 0 result is valid BCD. When addition is more than 9 and carry is 0 as well as when addition is more than 15 and carry is 1 result of binary adder IC is Invalid BCD. We can convert

invalid BCD to valid BCD by adding six. Max addition (9+9) result is 18 if carry input is 0 and 19 if carry input is 1. Thus for binary result greater than 9 six should be added to the result as a correction factor using combinational circuit.

74LS83 can also be used to implement the BCD subtractor. For BCD subtraction first we have to find 9's complements. To find 9's complements using IC-74LS83, first find 1's complement of a given number then add to 1010.

PIN Diagram:
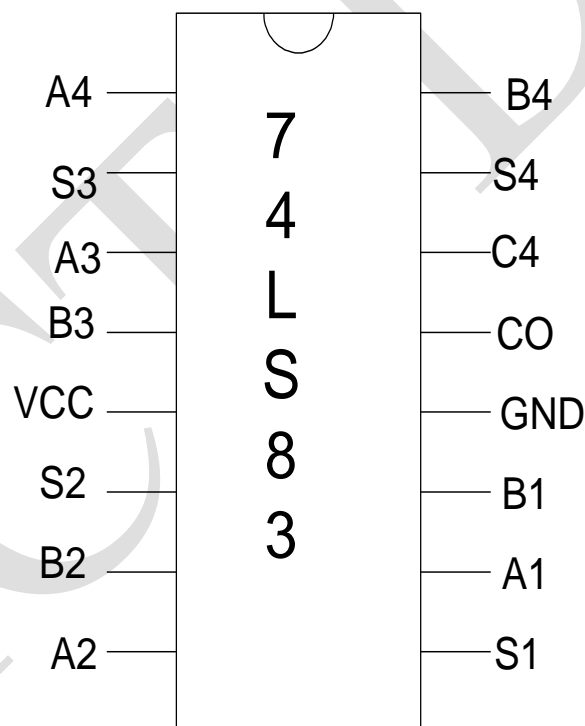
PROCEDURE:

1. Make the connections as per the Logic circuit of 1 digit BCD adder using IC74LS83 and Verify its Truth Table.

2. Make the connections as per the Logic circuit of 9's complement circuits using IC74LS83 and Verify its Truth Table.

3. Make the connections as per 4 bit binary adder using

   IC74LS83 and Verify its Truth Table.
4. Make the connections as per 4 bit binary sub tractor using

   IC74LS83 and Verify its Truth Table

5. Make the connections as per 4 bit binary adder/subtractor Using IC74LS83 and Verify its Truth Table
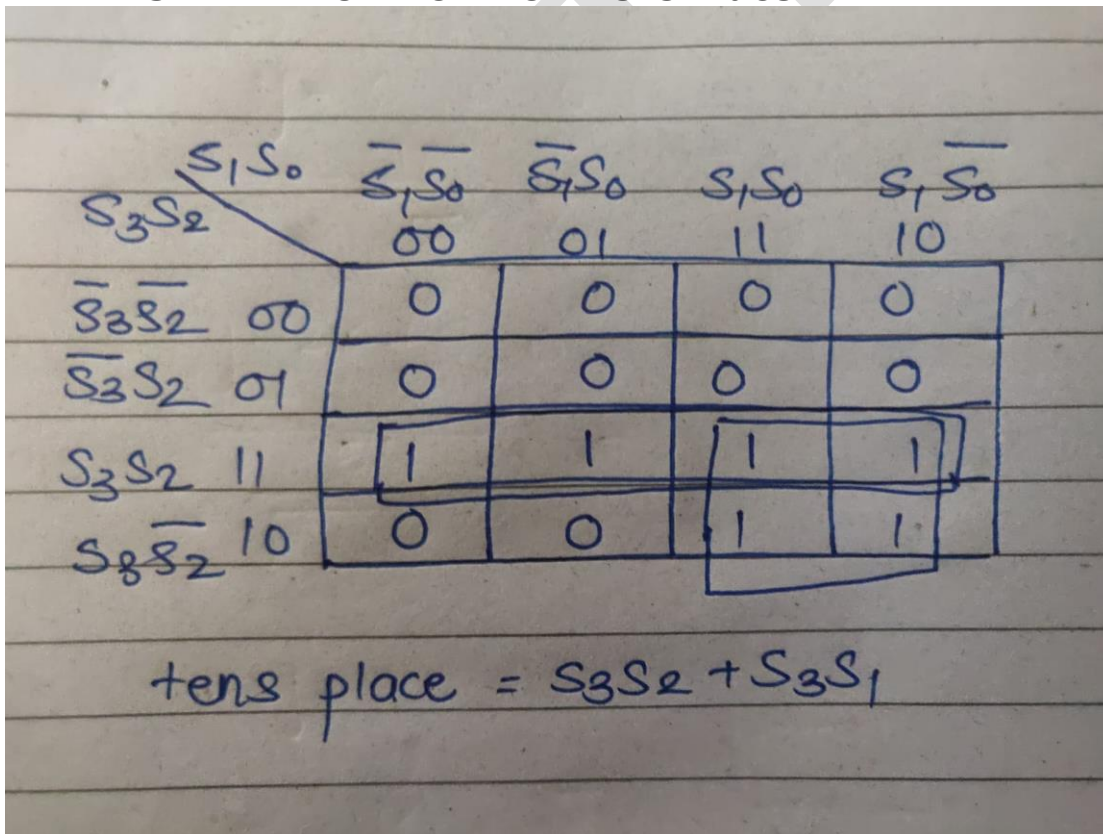
TRUTH -TABLE:

1) Single Digit BCD Adder:

Carry(Cout)	FIRST 7483's 4 BIT BINARY SUM				Tens Place
	S_3	S_2	S_1	S_0	
0	0	0	0	0	0
0	0	0	0	1	0
0	0	0	1	0	0
0	0	0	1	1	0
0	0	1	0	0	0
0	0	1	0	1	0
0	0	1	1	0	0
0	0	1	1	1	0
0	1	0	0	0	0
0	1	0	0	1	0
0	1	0	1	0	1
0	1	0	1	1	1
0	1	1	0	0	1
0	1	1	0	1	1

0	1	1	1	0	1
0	1	1	1	1	1
1	0	0	0	0	1
1	0	0	0	1	1
1	0	0	1	0	1
1	0	0	1	1	1
1	0	1	0	0	1
1	0	1	0	1	1
1	0	1	1	0	1
1	0	1	1	1	1
1	1	0	0	0	1
1	1	0	0	1	1

K-MAP SIMPLIFICATION FOR Tens Place:

$$tens\ place = S_3 S_2 + S_3 S_1$$

Logic Diagram: (1 Digit BCD Adder) :
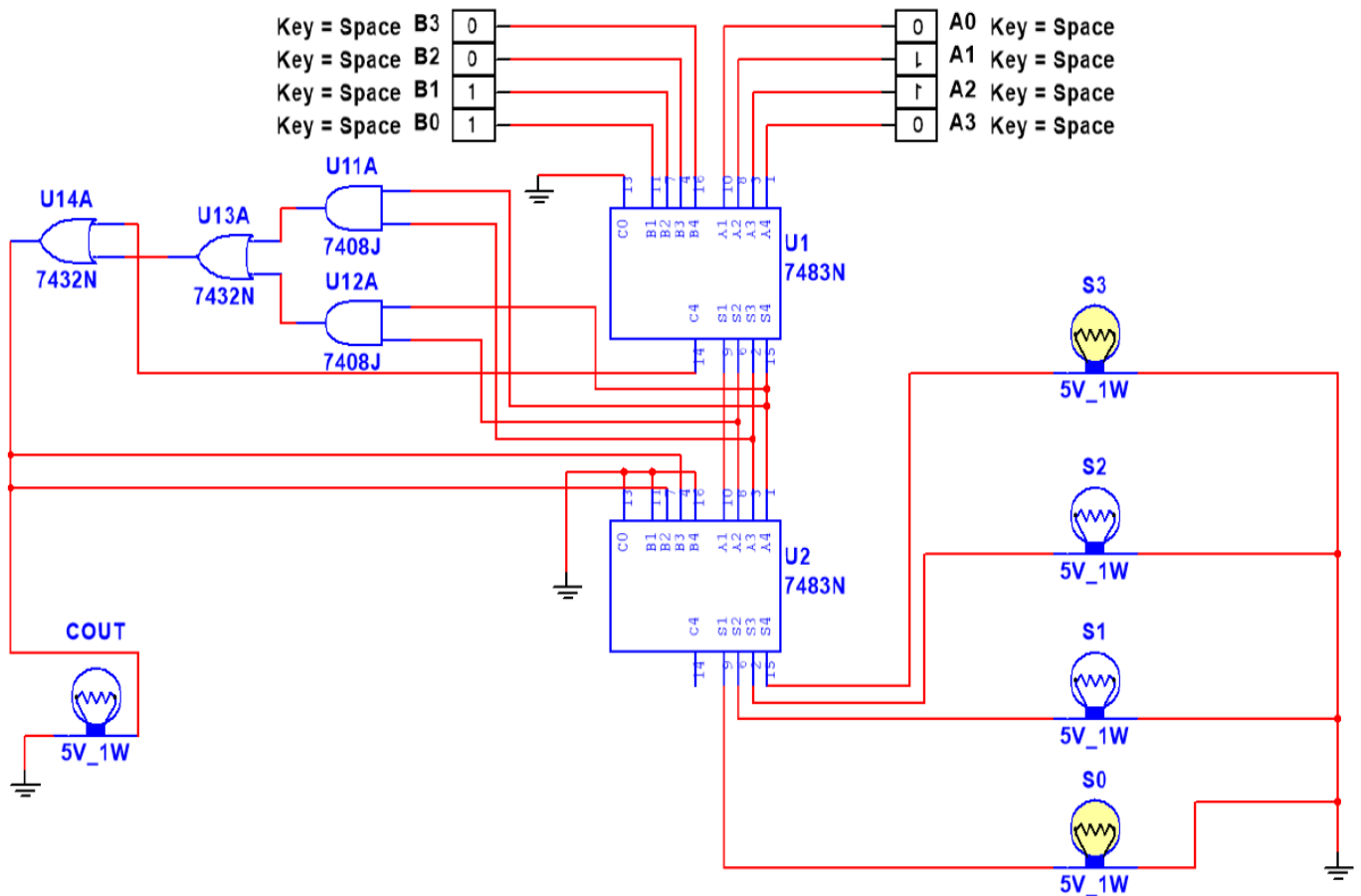
Observation table :

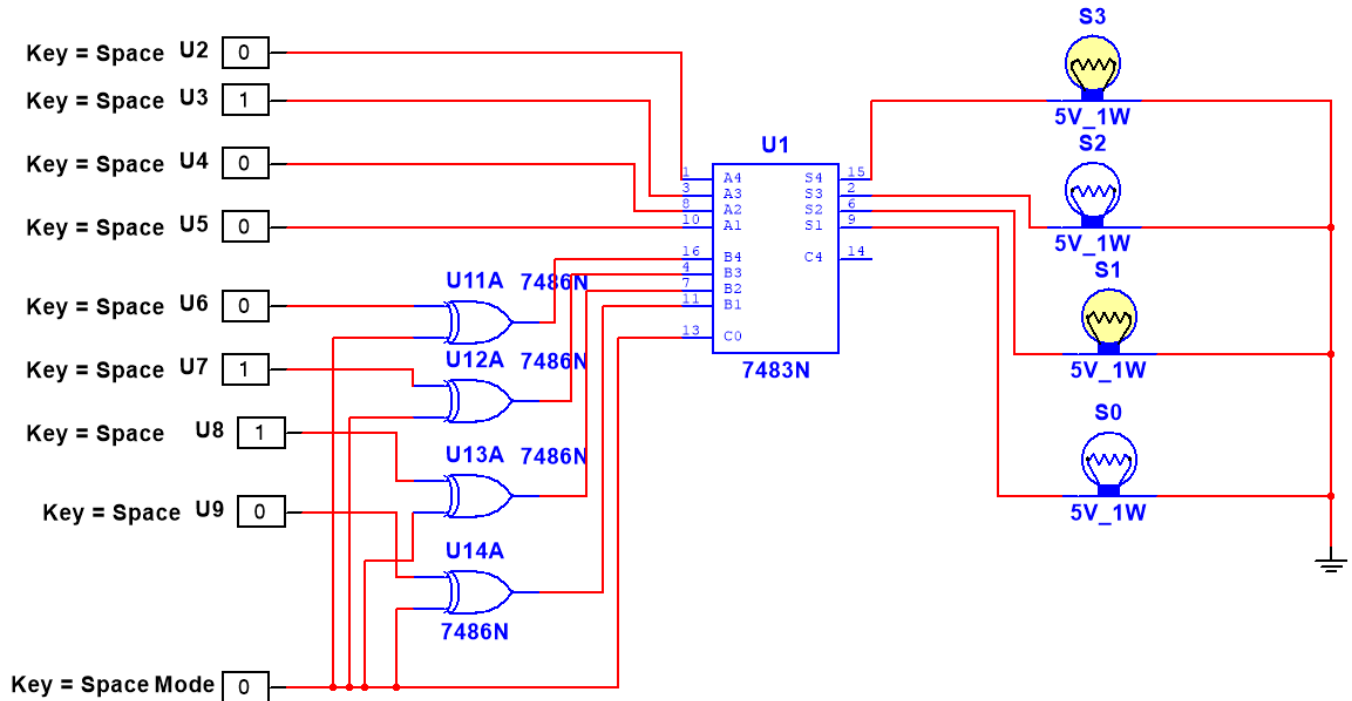| BCD Input A	BCD Input B	RESULT	
		Tens place	Units place
0010	0011	0	0101
0101	0001	0	0110
0001	1000	0	1001
0111	0100	1	0001
0110	0110	1	0010
1000	0110	1	0100

2. Implement 9's complement circuit.

9's complement of a no. = 9 − no.

= 9 + 2's complement of no.

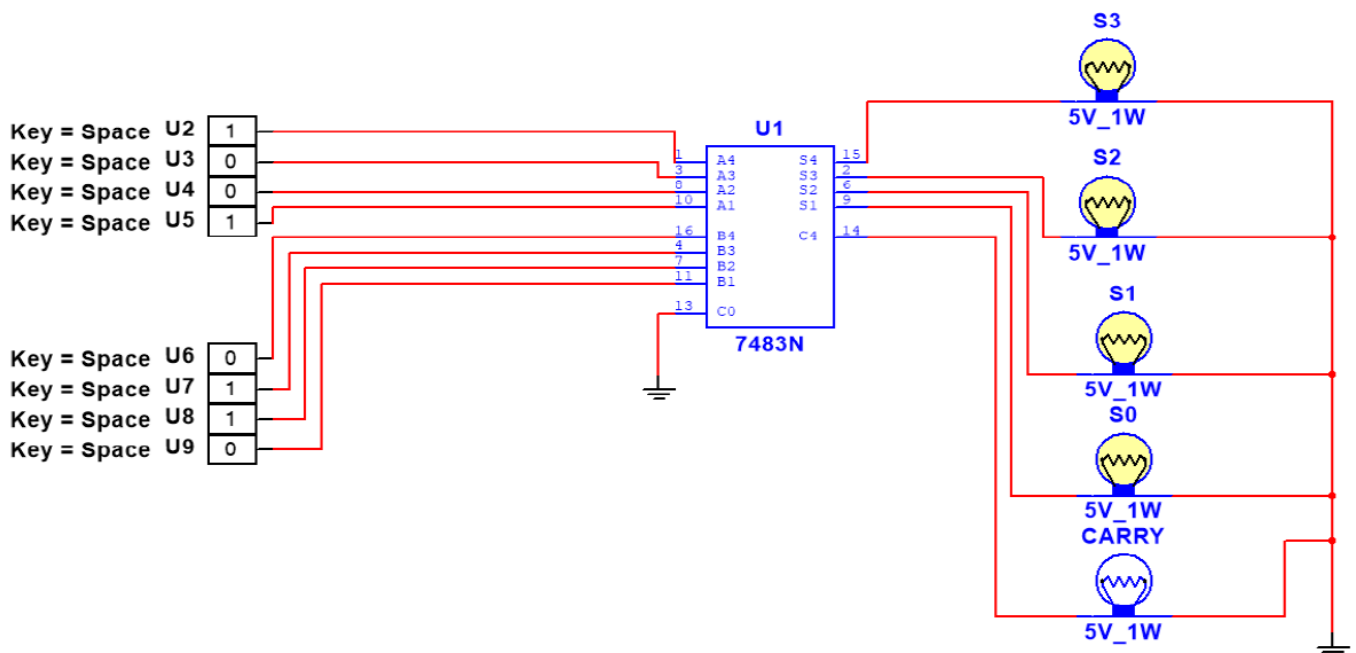= 9 + 1's complement of no. + 1

= 10 + 1's complement of no.

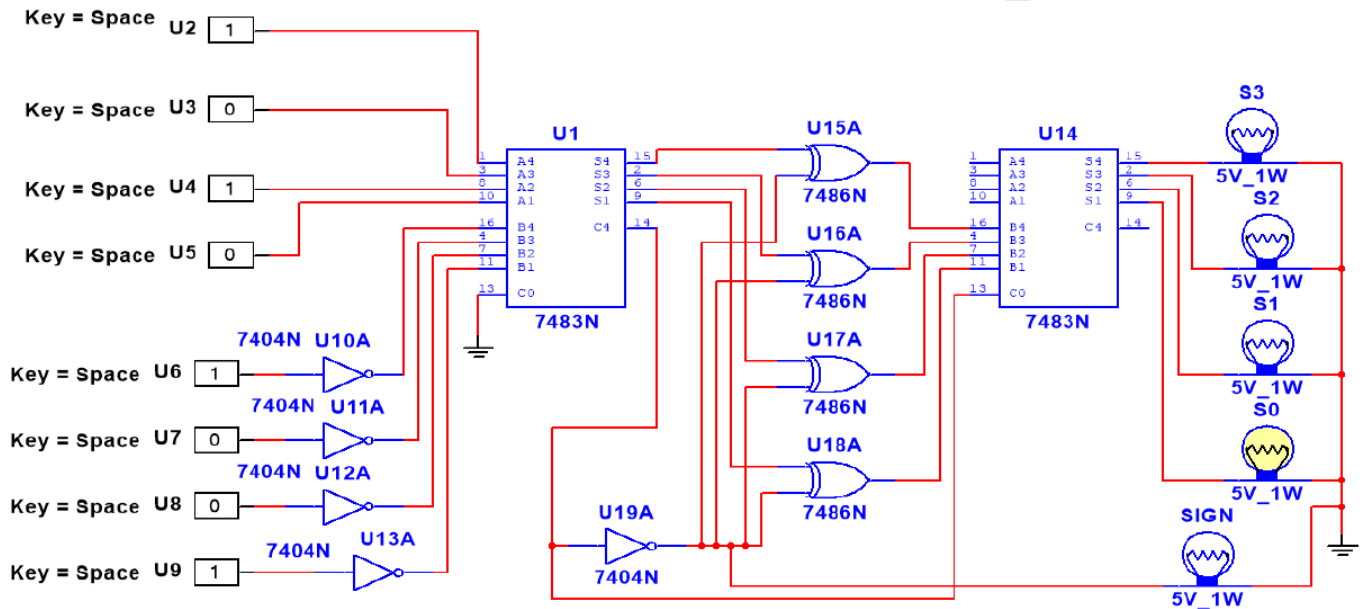**Logic Diagram: (9's Complement)**
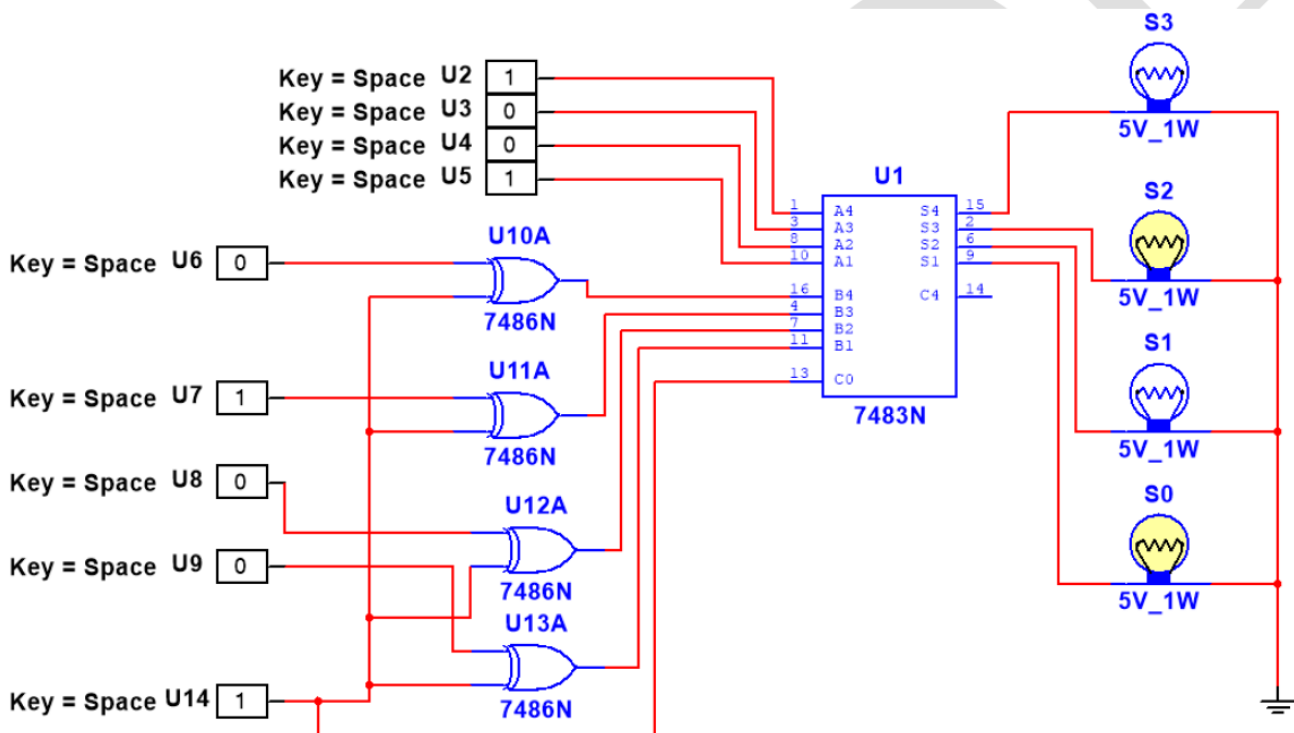
3. Design of 4 bit binary adder /subtractor using mode control M:
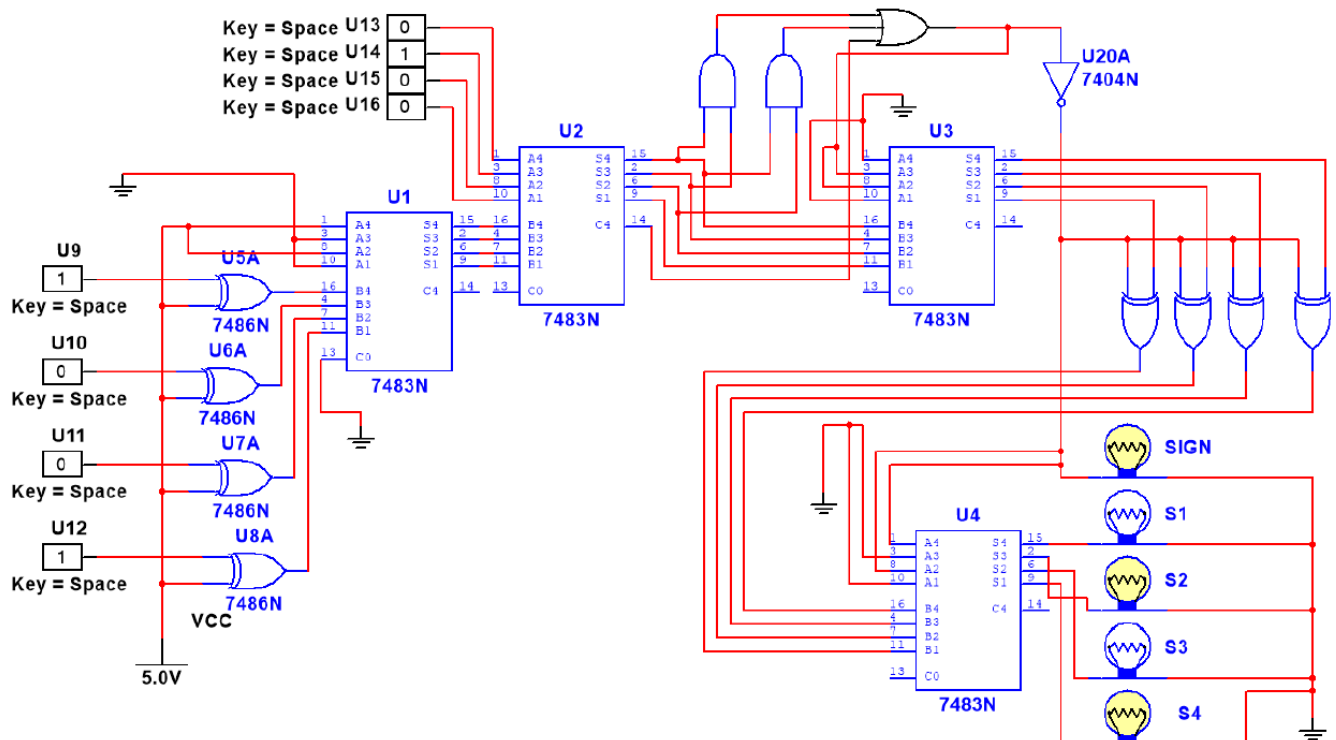

4.Design of 4 bit binary adder:

5. Design of 4 bit binary subtractor

6. Design Of single Digit BCD Subtractor

CONCLUSION :

1) 4 bit Binary Adder was designed and implemented using IC-74LS83.

2) 4 bit Binary Subtractor was designed and implemented for both positive and negative result using IC-74LS83.

3) 4 bit Binary Adder/ Subtractor with mode control M was designed and implemented for both positive and negative result using IC-74LS83.

4)Single digit BCD Adder circuit was designed and implemented using IC-74LS83.

5)9's Complement circuit was designed and implemented using IC 74LS83.

6) BCD Subtractor circuit was designed and implemented using IC 74LS83.

REFFRENCE:

1) **: R.P. Jain , "Modern digital electronics" , 4th edition**

2) **: A. Anand Kumar, "Fundamentals of digital circuits" 1st edition**

Subject teacher Sign with Date   Remark