

## Experiment No. 2

### 1. Title:

Design & verify the logic circuit for full adder using logic gates.

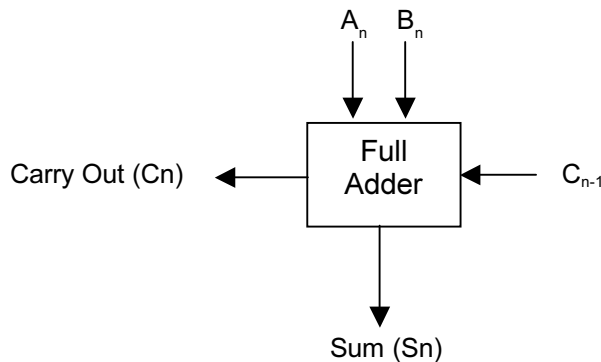
### 2. Prior Concept :

Binary addition , basic gates and EX- OR gate, K- map, half adder circuit.

### 3. New Concept :

#### Proposition - 1 :

A full adder circuit performs addition of two one bit numbers with previous carry.



#### Proposition - 2 :

Full adder circuit also can be designed using half adder circuit.

### 4. Learning Objectives :

#### 4.1 Intellectual Skills :-

- a. To prepare the truth table for full adder.
- b. To design the full adder circuit.

#### 4.2 Motor Skills :

- a. To build the full adder circuit on breadboard.
- b. To verify the practical results with the help of LEDs, Multimeter or CRO.

### 5. Apparatus :

DC Power supply, Connecting wires, breadboard, LEDs, Current limiting resistors (e.g 270Ω). ICs required - See the output equation from k- map and decide the IC numbers required for implementation of given equation.

### 6. Diagram :

#### 6.1 Draw the circuit diagram of half adder :

## 6.2 Draw the block diagram of full adder :

## 6.3 Draw circuit diagram of Full Adder

## 7. Procedure :

7.1 Full adder is combinational circuit that forms arithmetic sum of three input bits. It consist of three inputs and two outputs. Two of the input variables, denoted by  $A_n$  and  $B_n$ , represent the two significant bits to be added. Third input  $C_{n-1}$  represents the carry from the previous lower significant position.

7.2 Complete the truth table for full adder.

Inputs			Outputs	
$A_n$	$B_n$	$C_{n-1}$	$C_n$	$S_n$
0	0	0		
1	1	1		

7.3 Prepare the K-maps for sum and carry.

1. For Sum :

$A_n$ \ $B_n C_{n-1}$				

Expression for Sum:

$$S_n =$$

2. For Carry :

$A_n$ \ $B_n C_{n-1}$				

Expression for Carry:

$$C_n =$$

7.4 Realize the full adder using NAND-NAND circuit.

7.4.1 Implementation for sum.

7.4.2 Implementation for Carry.

- 7.5 Build the designed circuit on bread board.
- 7.6 Connect LEDs or multimeter or CRO at the output terminals of Full Adder.
- 7.7 Apply Vcc to designed circuit.
- 7.8 Verify truth table by observing status of LEDs or multimeter or on CRO.

**8. Result:**

Verified the truth table as follows.

8.1 Verified the truth table of Full Adder as  $S_n = 1$  i.e LED which is connected to  $S_n$  terminal glows when inputs are

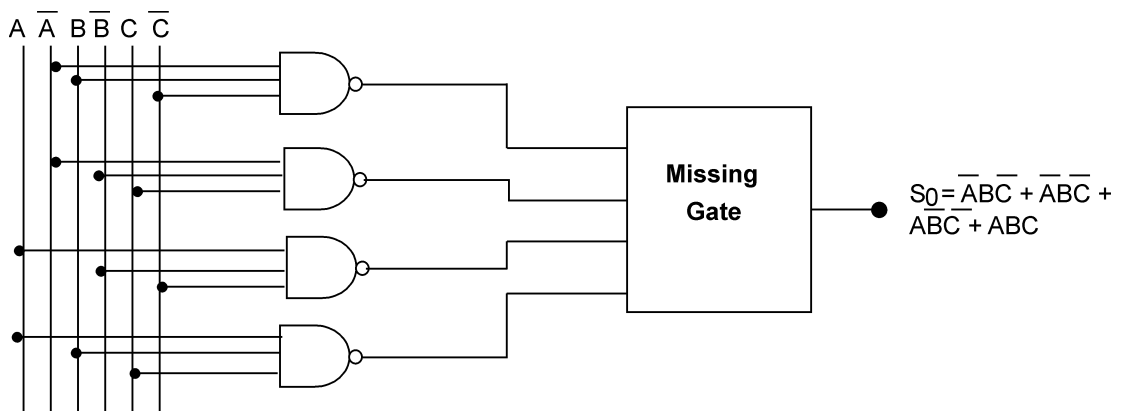
$A_n$	$B_n$	$C_{n-1}$
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

8.2 Verified the truth table of Full Adder as  $C_n = 1$  i.e LED which is connected to  $C_n$  terminal glows when inputs are

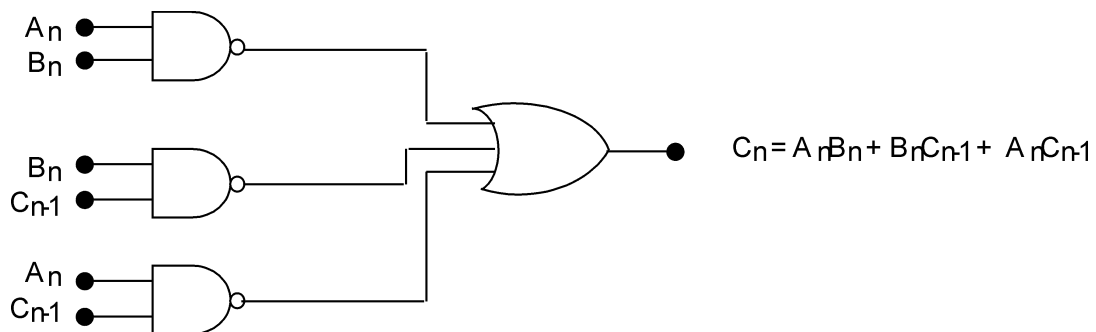
$A_n$	$B_n$	$C_{n-1}$
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

**9. Questions : (Attempt three questions as directed by the teacher)**

- 1) List the different ICs with their functions used in this experiment.
- 2) Sketch the pin diagram of IC 7486, IC 7402, IC 7408, IC 7432.
- 3) Identify the missing gate in the given circuit diagram and redraw the corrected circuit

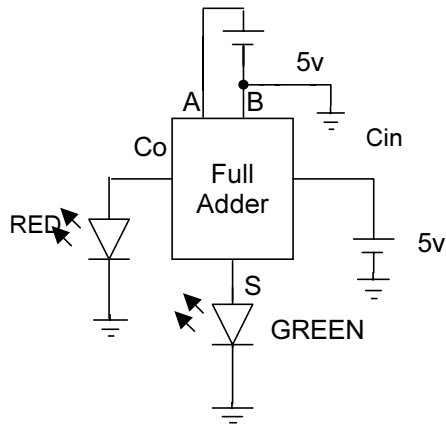


4) Correct the given circuit diagram and redraw the corrected circuit.

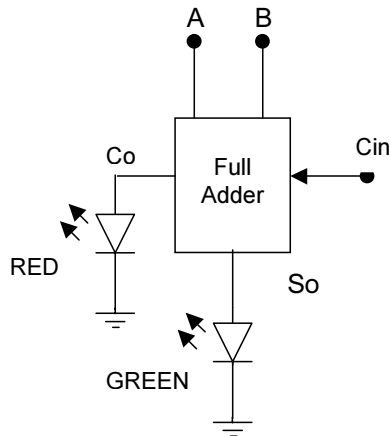


- 5) Name the IC, which can be used as four bit adder.
- 6) Draw pin diagram of IC 7483.
- 7) Is it possible to design full adder circuit using NOR gates?

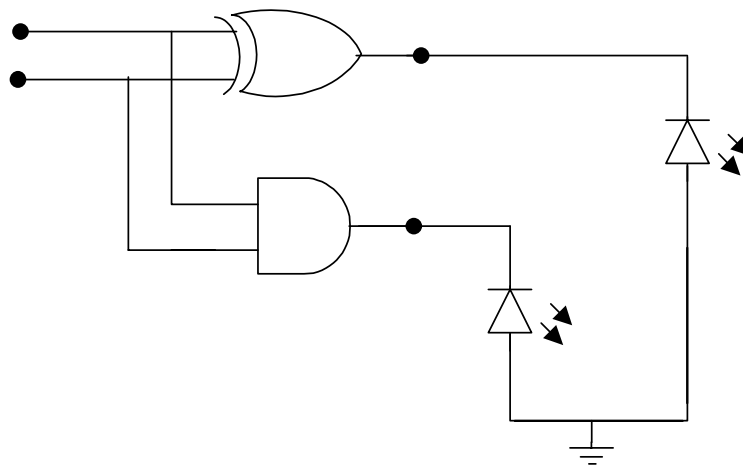
- 8) Implement the full adder using the NOR gates.
- 9) Give the status of LEDs given in the following figure.



- 10) Give the combinations of input for the ON status of green and red LEDs



- 11) Make the overall corrections into the half adder circuit for observation of output and redraw the circuit.



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