

### Experiment No:3

Construction of half adder and full adder using XOR and NAND gates and verification of its operation.

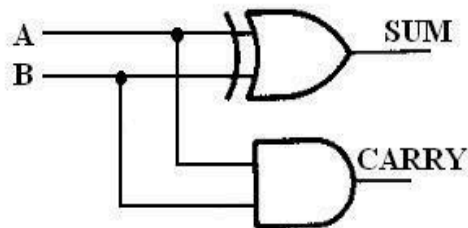
**Apparatus:** Logic trainer kit, Logic gates: XOR (IC 7486), NAND(7400).

#### Theory:

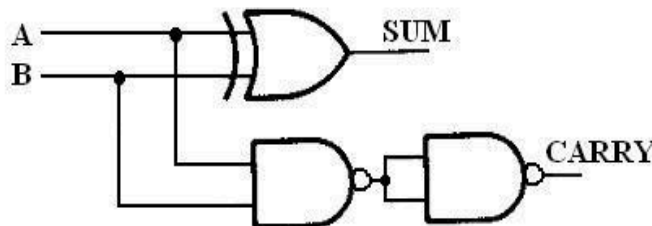
A half adder can add two bits at a time. Its outputs are SUM and CARRY. For two bit addition- SUM will be 1, if only one input is 1(X-OR operation). CARRY will be one, when both inputs are 1 (AND operation). So, by using one AND gate and one X-OR gate, a half adder circuit can be constructed. Boolean expressions for the outputs are:  $SUM = AB' + A'B$   $CARRY = AB$ . Full adder sum and carry expressions can be found out with help of its truth table.

A	B	SUM	CARRY
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$SUM = A'B + AB'$   
 $SUM = A \oplus B$   
 $CARRY = AB$



**HALF- ADDER CIRCUIT**  
(WITH one AND GATE and ONE XOR GATE)



**HALF- ADDER CIRCUIT**  
(WITH XOR GATE and NAND GATES)

#### Procedure:

1. Connect the trainer kit to AC power supply.
2. Connect logic sources to the inputs of the adder.
3. connect output from SUM and CARRY to logic indicators.
4. Apply various input combinations to the adder.
5. Observe the SUM and CARRY outputs, verify the truth table for each input/ output combination.
6. Switch off the ac power supply.