ECE 301 Digital Electronics

Adder Circuits

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OBJECTIVE

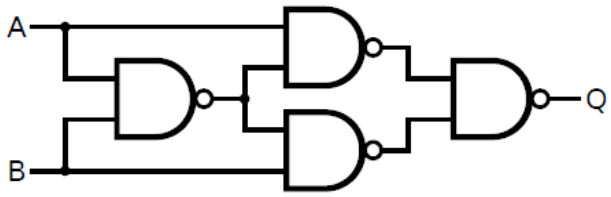
To build and verify the correct operation of a Half Adder, a Full Adder, and a 2-bit Ripple Carry Adder.

PREPARATION

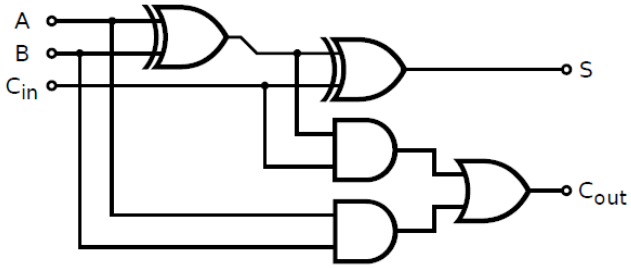
1. Construct the truth table for the Half Adder. (**inputs**: A, B; **output**: Sum)
2. Construct the truth table for the Full Adder. (**inputs**: A, B, C_{in}; **ouputs**: Sum, C_{out})
3. Draw a block diagram for a 2-bit Ripple Carry Adder (from two 1-bit Full Adders).

PROCEDURE

1. Design and build a Half Adder using five NAND gates only.
   Hint: An XOR gate can be realized using four NAND gates as illustrated below



2. Design and build a Full Adder using two XOR gates, two AND gates, and one OR gate.



3. Design and build a 2-bit Ripple Carry Adder.
   a. Build a second Full Adder (using the same set of gates as in part 2).

   b. Connect the two Full Adders to realize the 2-bit Ripple Carry Adder.

4. Demonstrate the correct operation of all adder circuits to the TA. The adder circuits should work for all combinations of the inputs.