PHSX 536: Homework #10

April 13, 2025

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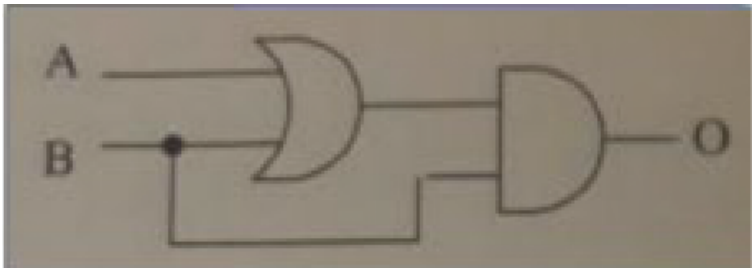
Problem 1

Q1. Prob. 7.16 (1e: 7.11) Determine the truth table for the circuit below

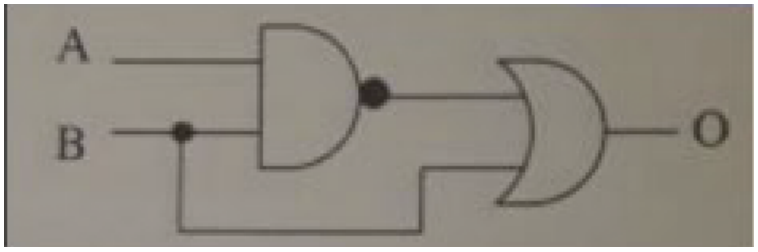


Solution:
I will label "X" the line out of the OR gate.

A	B	X	O
0	0	0	0
0	1	1	1
1	0	1	0
1	1	1	1
1	0	1	0

Problem 2

Q2 Prob. 7.17 (1e: 7.12) Determine the truth table for the circuit below

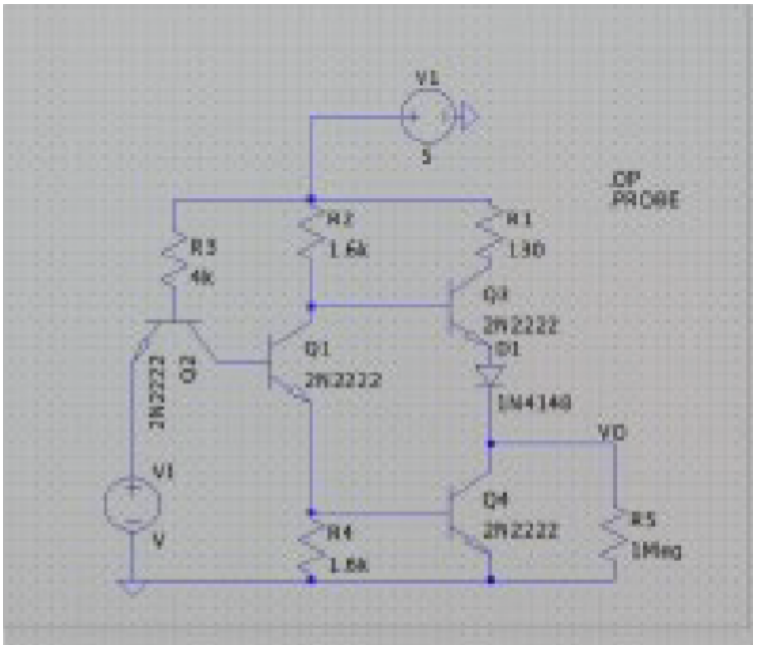


Solution:
I will label "X" the line out of the NAND gate.

A	B	X	O
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	1

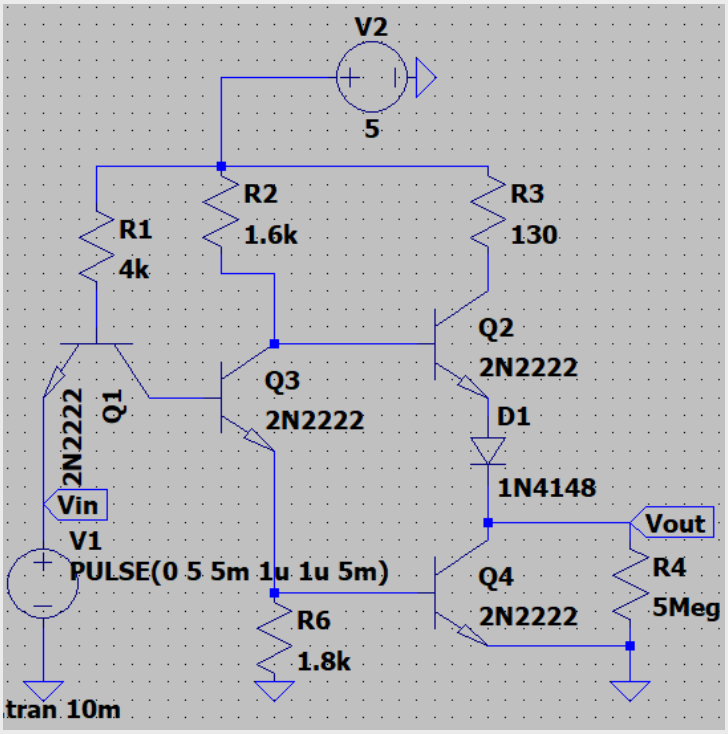
Problem 3

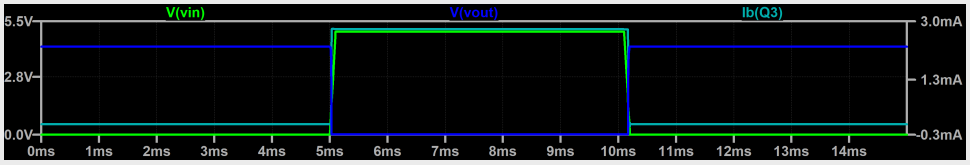
Simulate the circuit shown below and answer the following questions.



(a) Vary the input voltage between 0 and 5 V and verify that the circuit is consistent with the standard TTL logic

Solution:





We can see from this that the output is an inverted high/low signal, consistent with the intended logic.

(b) Determine whether current is entering or leaving the Q1 transistor

Solution:

I have included the current through the base of the indicated transistor in the previous figure, where from 0 to 5 ms we can see low current (entering) and high current (leaving) from 5 to 10ms when there is a high input.

(c) Remove the connection to the emitter of the Q1 transistor, which allows the gate input to "float". Determine whether such an input corresponds to a logical low or high? Explain.

Solution:

This seems to produce a constant high output.