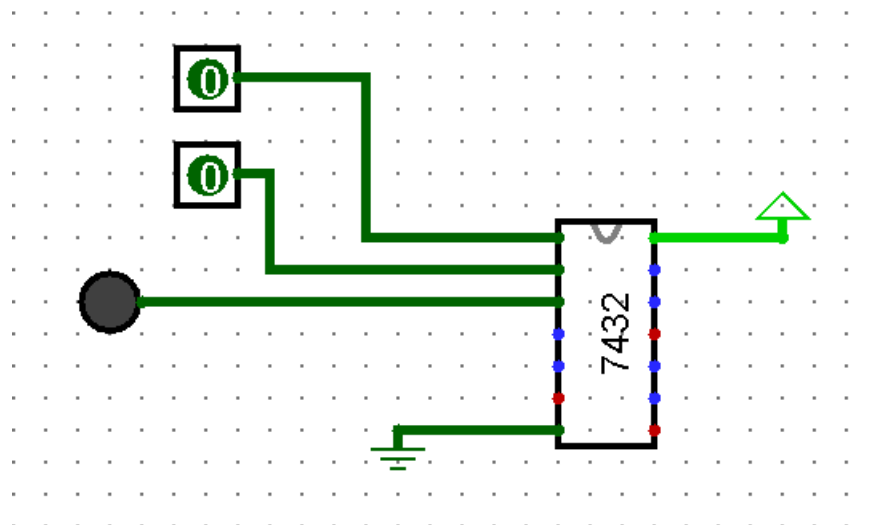


CS 20 Laboratory 4: Introduction to Integrated Circuits and Logic Gates

1. IC Basics

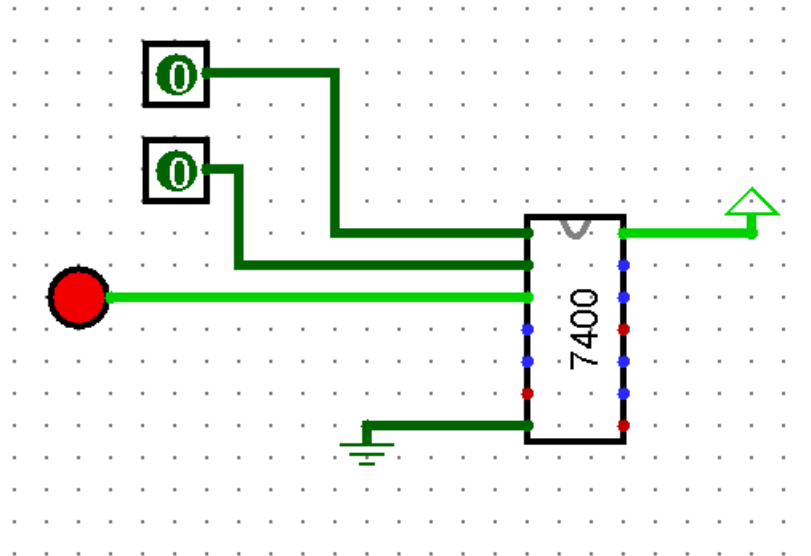
(a) Provide the truth tables for the 74LS32 setup. Attach a picture of the setup and include the Logisim file (cs20lab4_1a.circ) of the circuit.

Inputs		Output
1	2	3
0	0	0
0	1	1
1	0	1
1	1	1



(b) Provide the truth tables for the 74LS00 setup. Attach a picture of the setup and include the Logisim file (cs20lab4_1b.circ) of the circuit.

Inputs		Output
1	2	3
0	0	1
0	1	1
1	0	1
1	1	0



(c) What logic gate is implemented in the 74LS32 IC?

The logic gate implemented in 74LS32 IC is an **OR gate**.

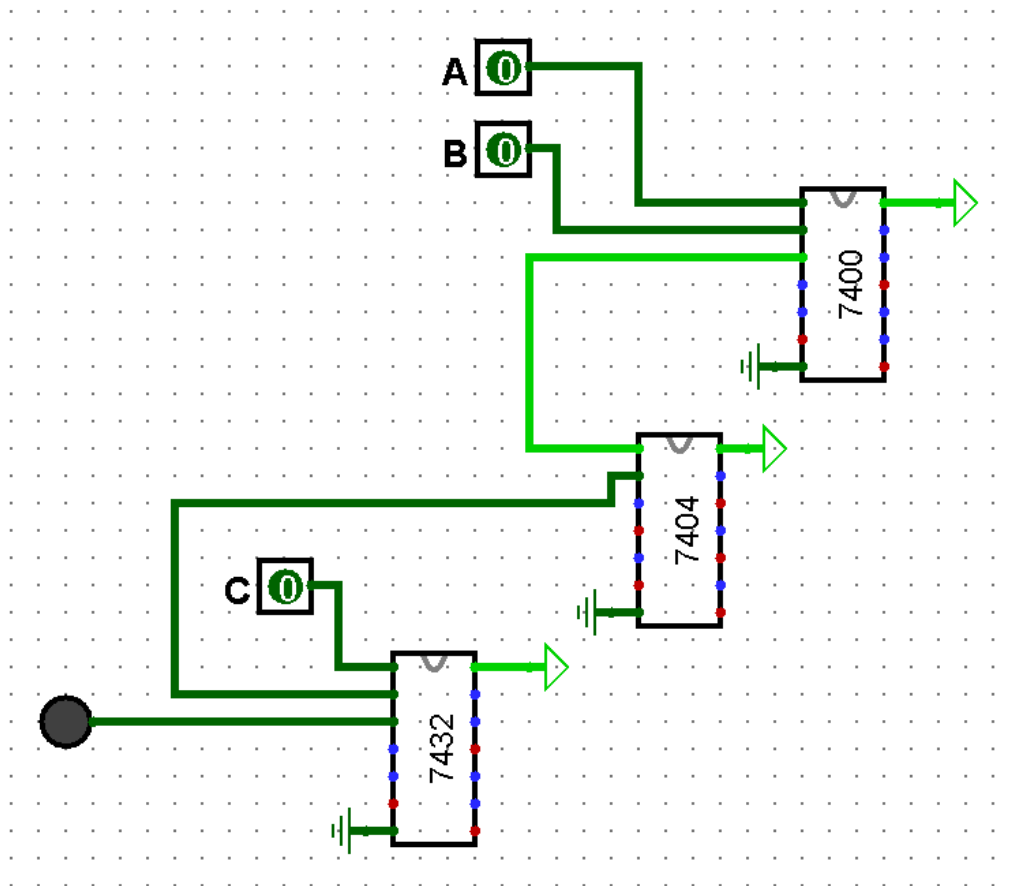
(d) What logic gate is implemented in the 74LS00 IC?

The logic gate implemented in 74LS00 IC is a **NAND gate**.

2. Integrating multiple ICs

(a) Provide the truth table for the whole setup. Attach a picture of the initial setup and include the Logisim file (cs20lab4_2.circ) of the circuit.

Inputs			Output
A	B	C	
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1



(b) What is the equivalent Boolean expression for the network of ICs in Logisim?

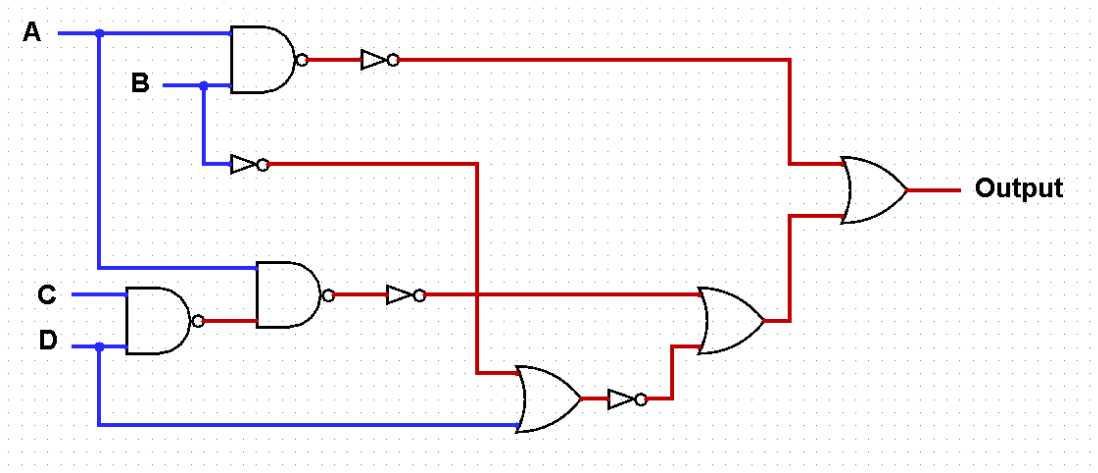
Using SOP of K-maps,

		bc				
		00	01	11	10	
a	0	0	1	1	0	AB
	1	0	1	1	1	
		C				

Hence, the Boolean expression is **C+AB**.

3. Boolean expressions using ICs

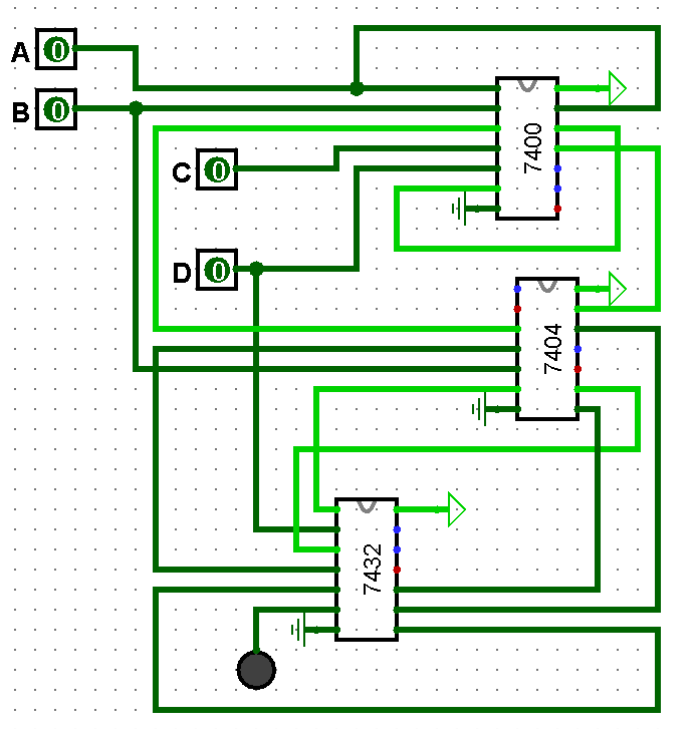
(a) Provide a sketch/diagram of the network of logic gates for the whole setup. In addition, include the Logisim file (cs20lab4_3.circ) of the circuit.



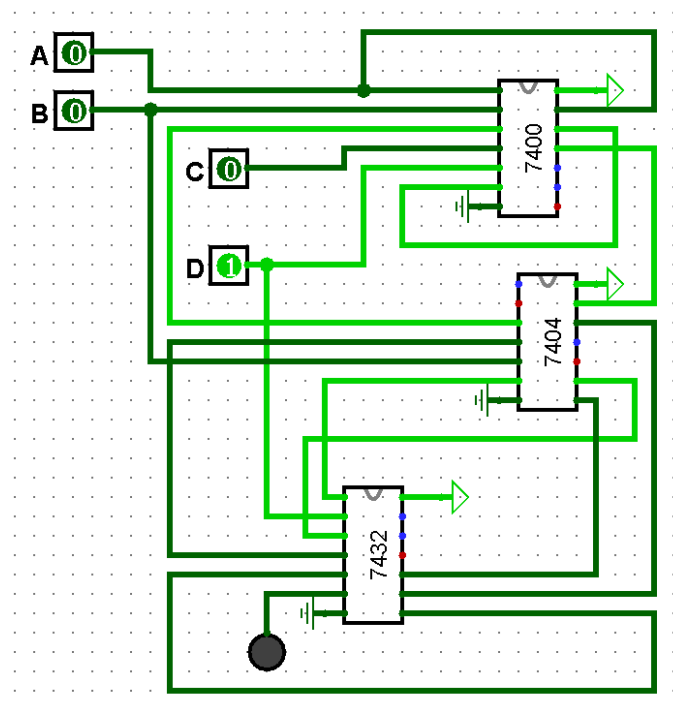
(b) Provide the truth table for the expression. Attach pictures as proof for each combination of inputs (16 in total, 0.25pts each). The inputs have to be visible and labelled.

Inputs				Output
A	B	C	D	
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

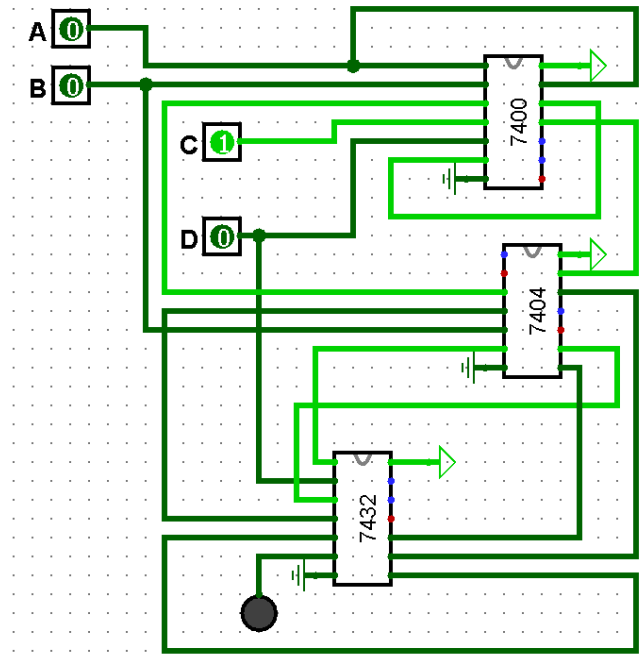
I. A = 0 C = 0 Output = 0
 B = 0 D = 0



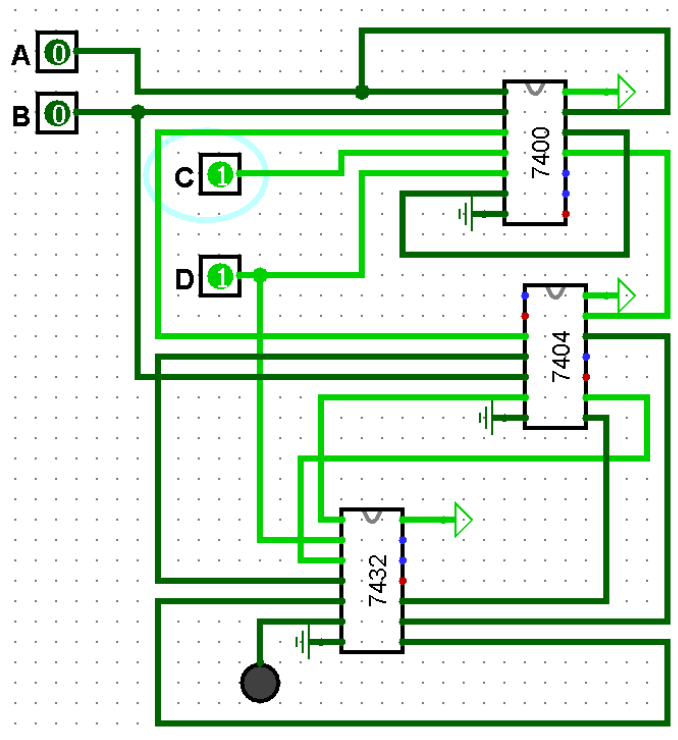
II. A = 0 C = 0 Output = 0
 B = 0 D = 1



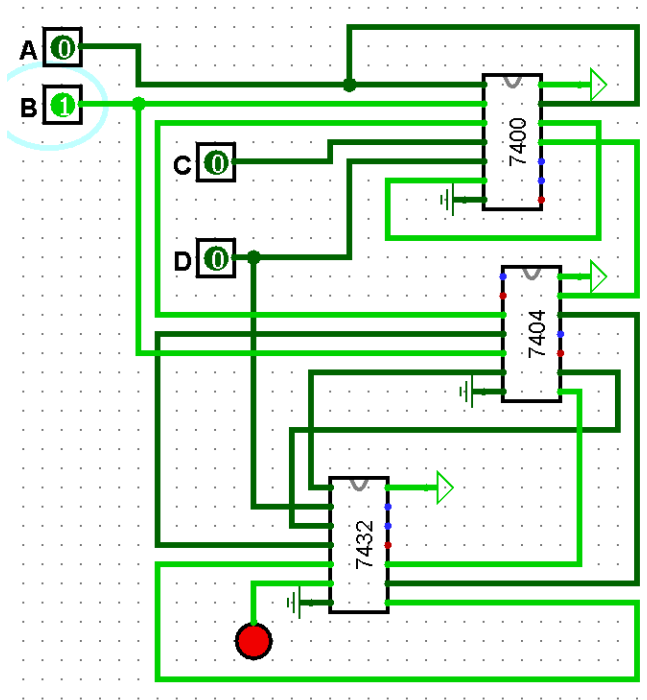
III. A = 0 C = 1 Output = 0
 B = 0 D = 0



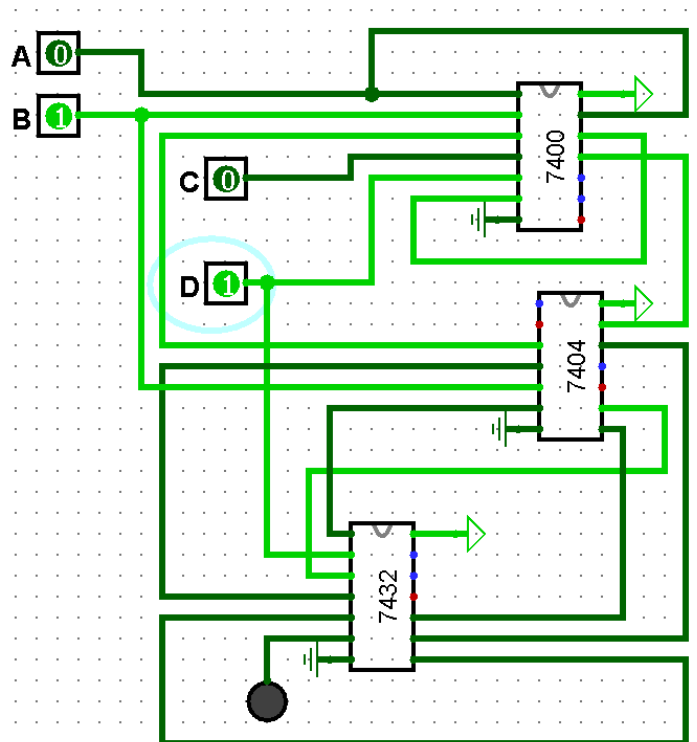
IV. A = 0 C = 1 Output = 0
 B = 0 D = 1



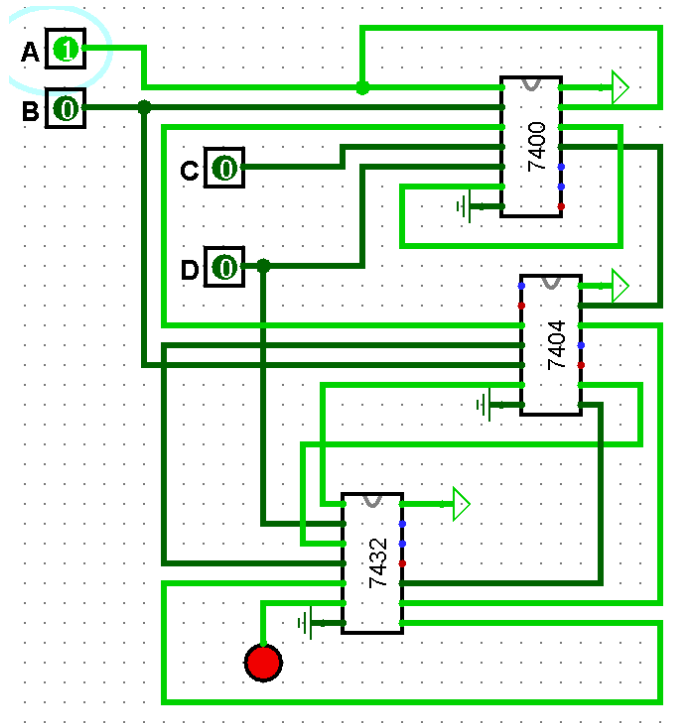
V. A = 0 C = 0 Output = 1
 B = 1 D = 0



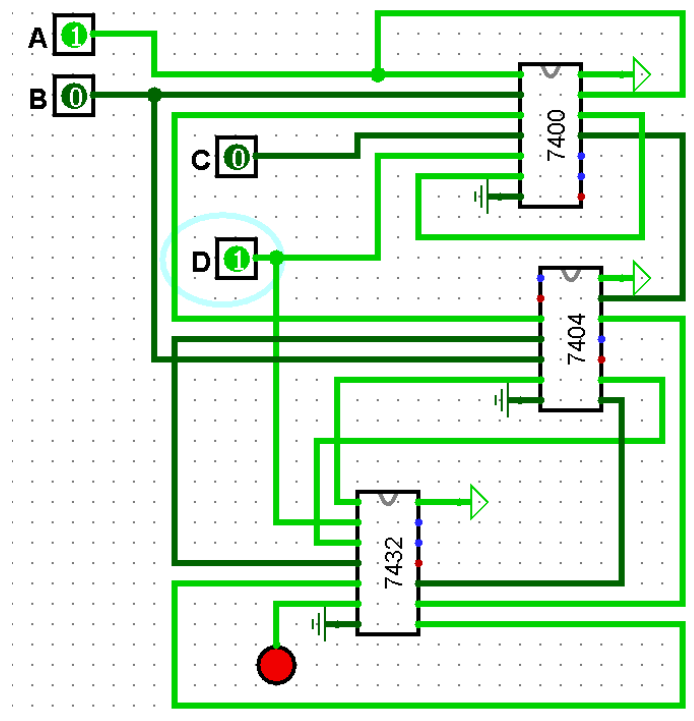
VI. A = 0 C = 0 Output = 0
 B = 1 D = 1



IX. A = 1 C = 0 Output = 1
 B = 0 D = 0



X. A = 1 C = 0 Output = 1
 B = 0 D = 1

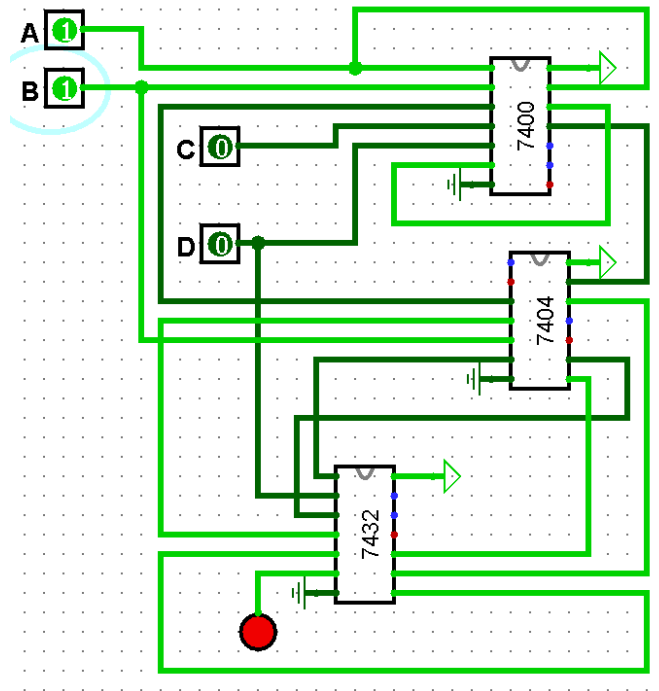


The diagram shows a logic circuit with four inputs (A, B, C, D) and three outputs. The inputs are represented by green boxes with their values: A=1, B=0, C=1, and D=1. Input D is circled in light blue. The circuit uses three 7400 NAND gates and one 7432 OR gate. The connections are as follows:

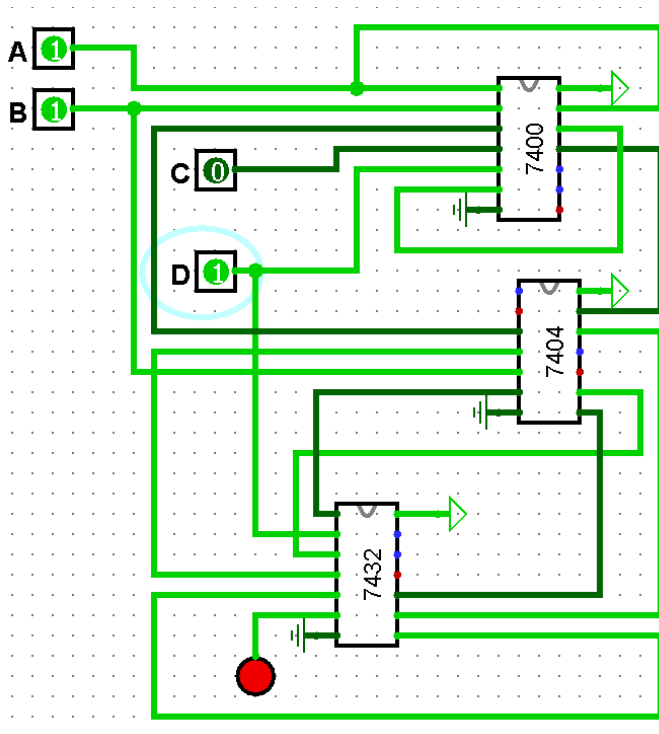
- 7400 Gate 1:** Inputs A and B. Output 1 (top right arrow).
- 7400 Gate 2:** Inputs C and D. Output 2 (middle right arrow).
- 7400 Gate 3:** Inputs A and C. Output 3 (bottom right arrow).
- 7432 Gate:** Inputs from the outputs of Gate 1 and Gate 2. Output 4 (bottom right arrow).

A ground symbol is connected to the bottom of the circuit.

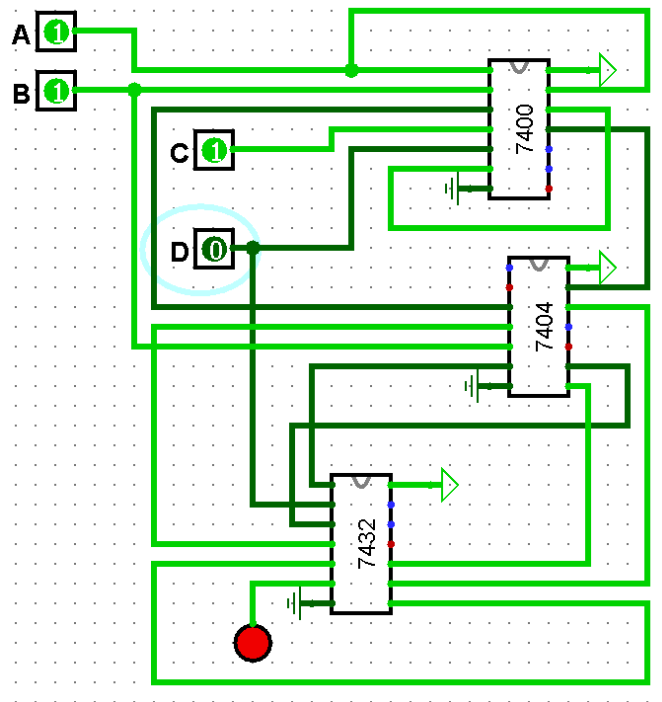
XIII. A = 1 C = 0 Output = 1
 B = 1 D = 0



XIV. A = 1 C = 0 Output = 1
 B = 1 D = 1



XV. A = 1 C = 1 Output = 1
 B = 1 D = 0



XVI. A = 1 C = 1 Output = 1
 B = 1 D = 1

