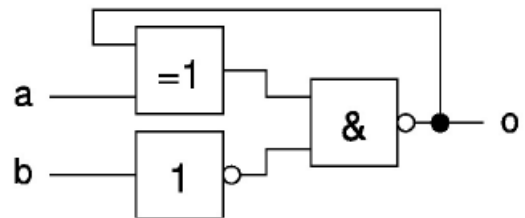


Foundations of Computer Science – Exercise 2

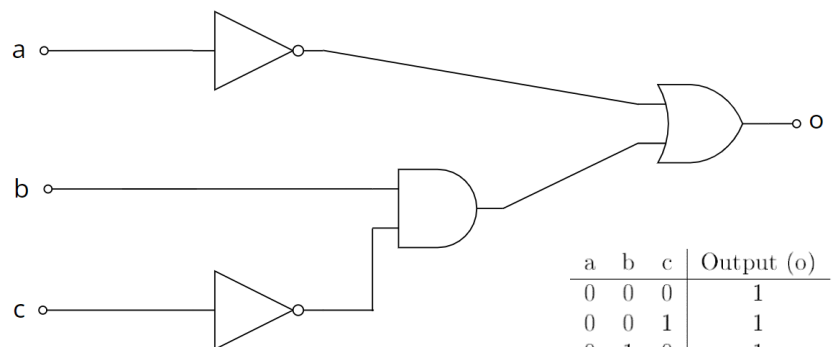
2.

a	b	o (o in)	!b	a XOR o	!b AND (a XOR o) (o out)
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	0	0	0
0	1	1	0	1	0
1	0	0	1	1	1
1	0	1	1	0	0
1	1	0	0	1	0
1	1	1	0	0	0



3.

$$\begin{aligned}
 o &= a'b'c' + a'b'c + a'bc' + a'bc + abc' \\
 &= a'b'(c' + c) + a'bc' + a'bc + abc' \\
 &= a'b' + a'bc' + a'bc + abc' \\
 &= a'(b' + bc') + a'bc + abc' \\
 &= a'b' + a'c' + a'bc + abc' \\
 &= a'b' + a'(c' + bc) + abc' \\
 &= a'b' + a'(c' + b) + abc' \\
 &= a'b' + a'c' + a'b + abc' \\
 &= a'(b' + b) + a'c' + abc' \\
 &= a' + a'c' + abc' \\
 &= a' + abc' \\
 &= a' + bc'
 \end{aligned}$$



a	b	c	Output (o)
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

4. Two good sources to learn about von Neumann architecture:

- <https://www.computerscience.gcse.guru/theory/von-neumann-architecture>
- <https://www.geeksforgeeks.org/computer-organization-von-neumann-architecture/>

They are good because they cover the most fundamental topics in a compact and easy to understand manner. A good source should provide a basic but balanced grasp of the topic, in a way that students can easily remember and understand.

	Von Neumann Architecture	Harvard Architecture
Bus usage	Same common bus is used for both data and instruction transfer	Separate buses are used for data and instruction transfer
CPU	A single memory connection is given to the CPU. CPU cannot access instructions and read/write at the same time	CPU is connected with both the data memory (RAM) and program memory (ROM), separately. CPU can access instructions and read/write at the same time
Clock cycle	2 clock cycles are required to execute 1 instruction as data needs to be fed before execution	Instruction is executed in 1 clock cycle
Based on	Traditional: Stored-Program Concept	Modern: Harvard Mark I Relay
Hardware	Less complicated hardware demands less space	More complicated hardware demands more space

5.

Decimal		Binary	
A	B	A	B
63	71	11101	1011
126	35	111010	101
252	17	1110100	10
504	8	11101000	1
1008	4	100111111	
2016	2		
4032	1		
4473			