Prelab Assignment 4
Introduction to Hardware

Levi Kaplan
kaplan.l@northeastern.edu

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Due Date: 10/15/20

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Digit Table

INPUTS				**Character**	**OUTPUTS**						
D3	**D2**	**D1**	**D0**	**#**	**a**	**b**	**c**	**d**	**e**	**f**	**g**
0	0	0	0	0	1	1	1	1	1	1	0
0	0	0	1	1	0	1	1	0	0	0	0
0	0	1	0	2	1	1	0	1	1	0	1
0	0	1	1	3	1	1	1	1	0	0	1
0	1	0	0	4	0	1	1	0	0	1	1
0	1	0	1	5	1	0	1	1	0	1	1
0	1	1	0	6	1	0	1	1	1	1	1
0	1	1	1	7	1	1	1	0	0	0	0
1	0	0	0	8	1	1	1	1	1	1	1
1	0	0	1	9	1	1	1	0	0	1	1
1	0	1	0	A	1	1	1	0	1	1	1
1	0	1	1	b	0	0	1	1	1	1	1
1	1	0	0	c	1	0	0	1	1	1	0
1	1	0	1	d	0	1	1	1	1	0	1
1	1	1	0	E	1	0	0	1	1	1	1
1	1	1	1	F	1	0	0	0	1	1	1

Boolean equation

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Prelab 4

$A = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + \quad 0$

$\overline{D_0}\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 2$

$D_0\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 3$

$D_0\,\overline{D_1}\,D_2\,\overline{D_3} + \quad 5$

$\overline{D_0}\,D_1\,D_2\,\overline{D_3} + \quad 6$

$D_0\,D_1\,D_2\,\overline{D_3} + \quad 7$

$\overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 8$

$D_0\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 9$

$\overline{D_0}\,D_1\,\overline{D_2}\,D_3 + \quad A$

$\overline{D_0}\,\overline{D_1}\,D_2\,D_3 + \quad C$

$\overline{D_0}\,D_1\,D_2\,D_3 + \quad E$

$D_0\,D_1\,D_2\,D_3 \quad F$

$b = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + \quad 0$

$D_0\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 1$

$\overline{D_0}\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 2$

$D_0\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 3$

$\overline{D_0}\,\overline{D_1}\,D_2\,\overline{D_3} + \quad 4$

$D_0\,D_1\,D_2\,\overline{D_3} + \quad 7$

$\overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 8$

$D_0\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 9$

$\overline{D_0}\,D_1\,\overline{D_2}\,D_3 + \quad A$

$D_0\,\overline{D_1}\,D_2\,D_3 \quad d$

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$C = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + D_0\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + D_0\,D_1\,\overline{D_2}\,\overline{D_3} + \overline{D_0}\,\overline{D_1}\,D_2\,\overline{D_3} + D_0\,\overline{D_1}\,D_2\,\overline{D_3} + \overline{D_0}\,D_1\,D_2\,\overline{D_3} + D_0\,D_1\,D_2\,\overline{D_3} + \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + D_0\,\overline{D_1}\,\overline{D_2}\,D_3 + \overline{D_0}\,D_1\,\overline{D_2}\,D_3 + D_0\,D_1\,\overline{D_2}\,D_3 + D_0\,\overline{D_1}\,D_2\,D_3$

0 1 3 4 5 6 7 8 9 A b d

$d = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + D_0\,D_1\,\overline{D_2}\,\overline{D_3} + D_0\,D_1\,\overline{D_2}\,D_3 + D_0\,\overline{D_1}\,D_2\,\overline{D_3} + \overline{D_0}\,D_1\,D_2\,\overline{D_3} + \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + \overline{D_0}\,D_1\,\overline{D_2}\,D_3 + D_0\,D_1\,\overline{D_2}\,D_3 + \overline{D_0}\,\overline{D_1}\,D_2\,D_3 + D_0\,\overline{D_1}\,D_2\,D_3 + \overline{D_0}\,D_1\,D_2\,D_3 + D_0\,D_1\,D_2\,D_3$

0 2 3 5 6 8 A b C d E F

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$e = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + \quad 0$

$\overline{D_0}\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 2$

$\overline{D_0}\,D_1\,D_2\,\overline{D_3} + \quad 6$

$\overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 8$

$\overline{D_0}\,D_1\,\overline{D_2}\,D_3 + \quad A$

$D_0\,D_1\,\overline{D_2}\,D_3 + \quad b$

$\overline{D_0}\,\overline{D_1}\,D_2\,D_3 + \quad C$

$D_0\,\overline{D_1}\,D_2\,D_3 + \quad d$

$\overline{D_0}\,D_1\,D_2\,D_3 + \quad E$

$D_0\,D_1\,D_2\,D_3 \quad F$

$f = \overline{D_0}\,\overline{D_1}\,\overline{D_2}\,\overline{D_3} + \quad 0$

$\overline{D_0}\,\overline{D_1}\,D_2\,\overline{D_3} + \quad 4$

$D_0\,\overline{D_1}\,D_2\,\overline{D_3} + \quad 5$

$\overline{D_0}\,D_1\,D_2\,\overline{D_3} + \quad 6$

$\overline{D_0}\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 8$

$D_0\,\overline{D_1}\,\overline{D_2}\,D_3 + \quad 9$

$\overline{D_0}\,D_1\,\overline{D_2}\,D_3 + \quad A$

$D_0\,D_1\,\overline{D_2}\,D_3 + \quad b$

$\overline{D_0}\,\overline{D_1}\,D_2\,D_3 + \quad C$

$\overline{D_0}\,D_1\,D_2\,D_3 + \quad E$

$D_0\,D_1\,D_2\,D_3 \quad F$

$g = \overline{D_0}\,D_1\,\overline{D_2}\,\overline{D_3} + \quad 2$

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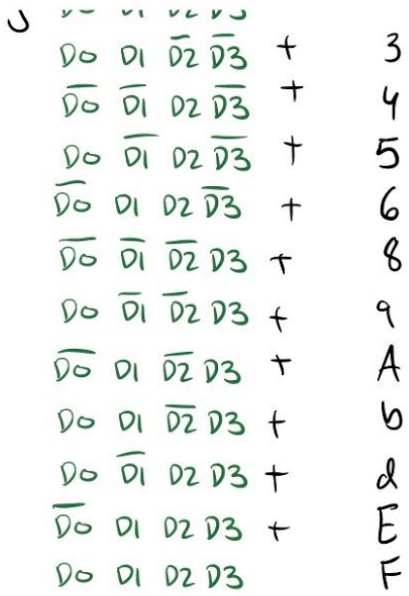

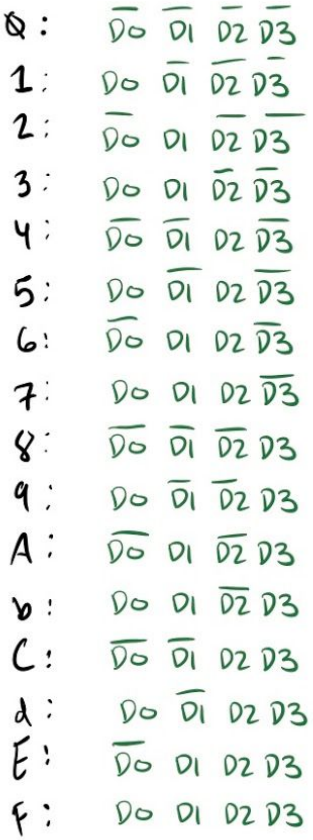

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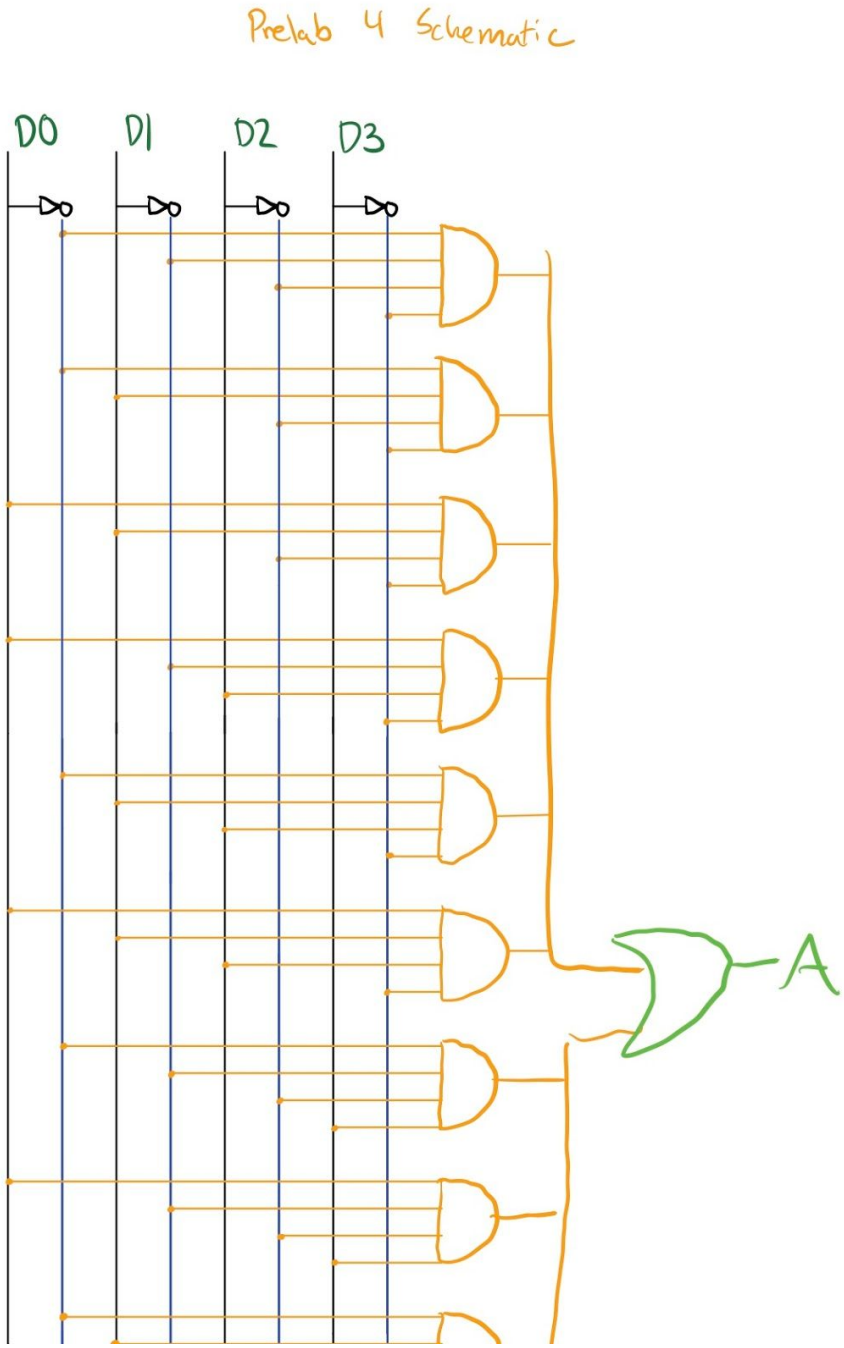
Full Schematic



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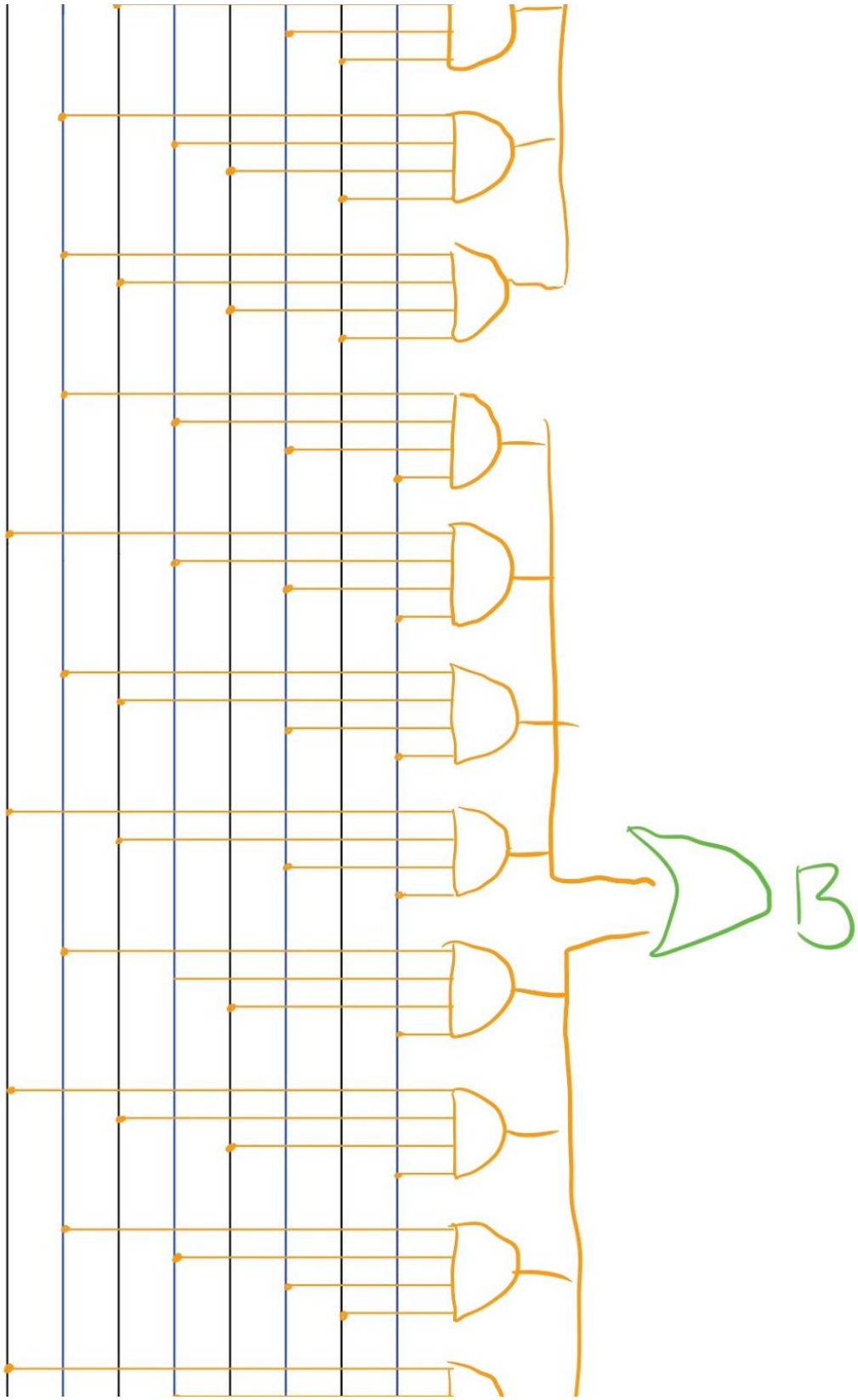

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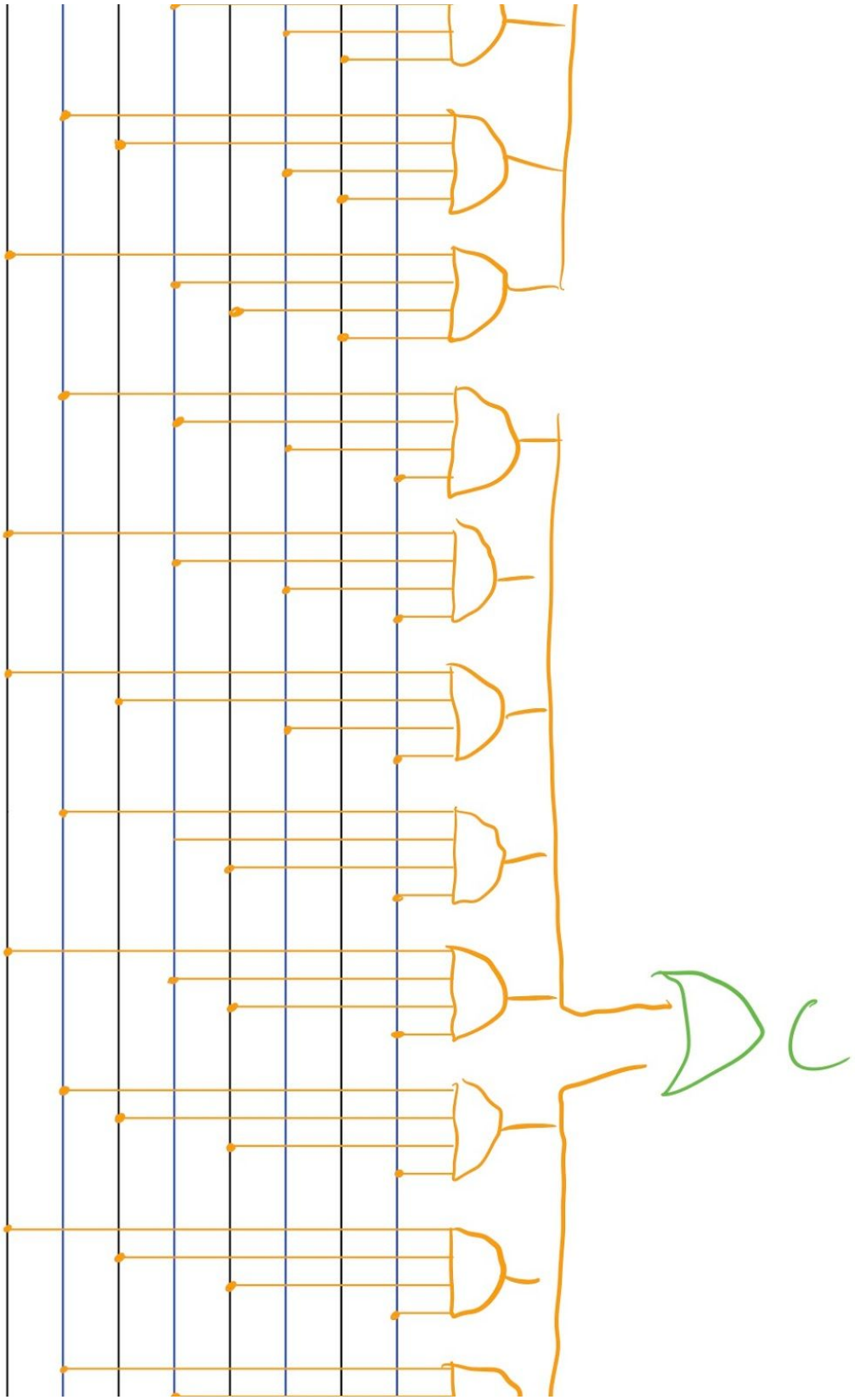

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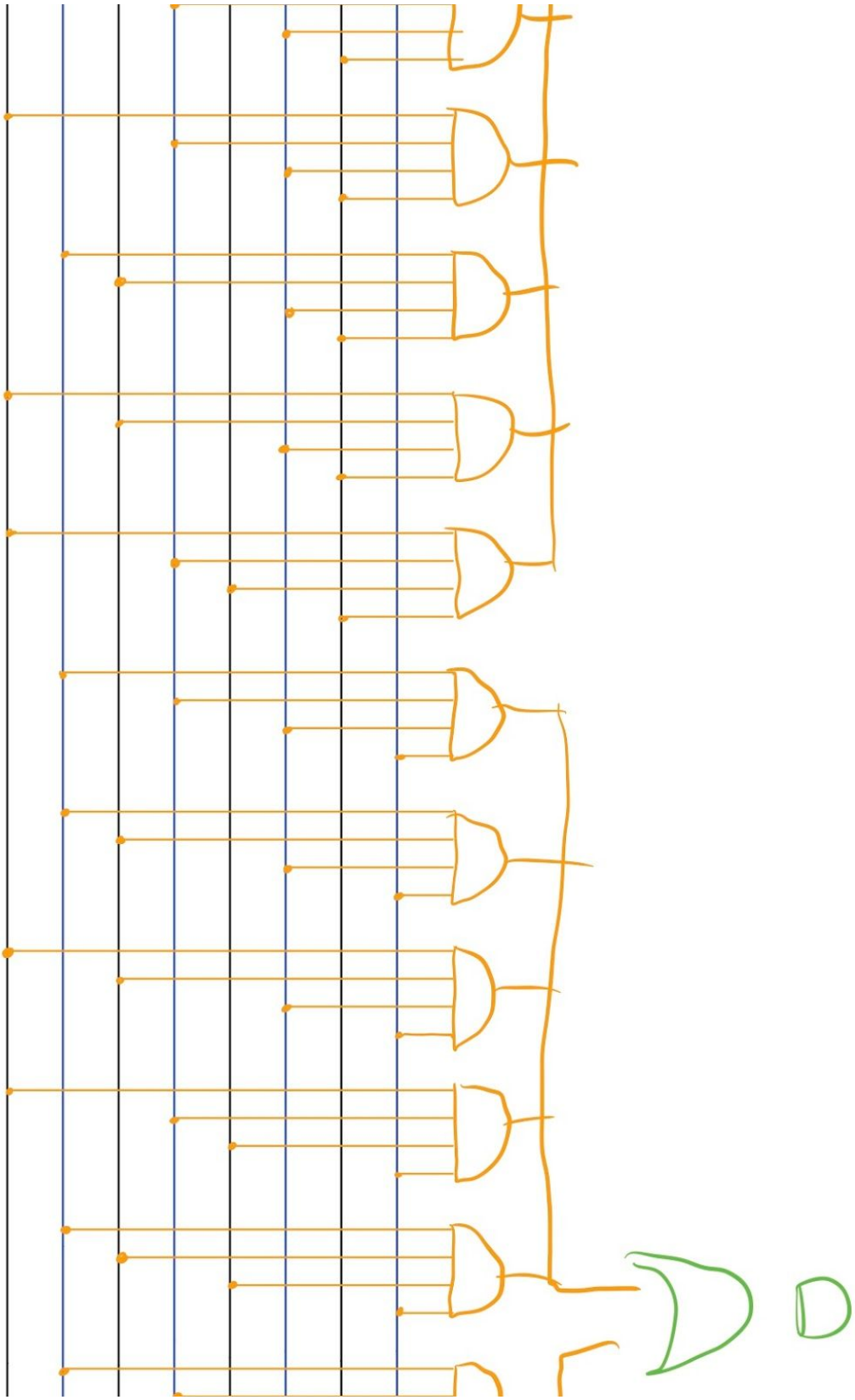

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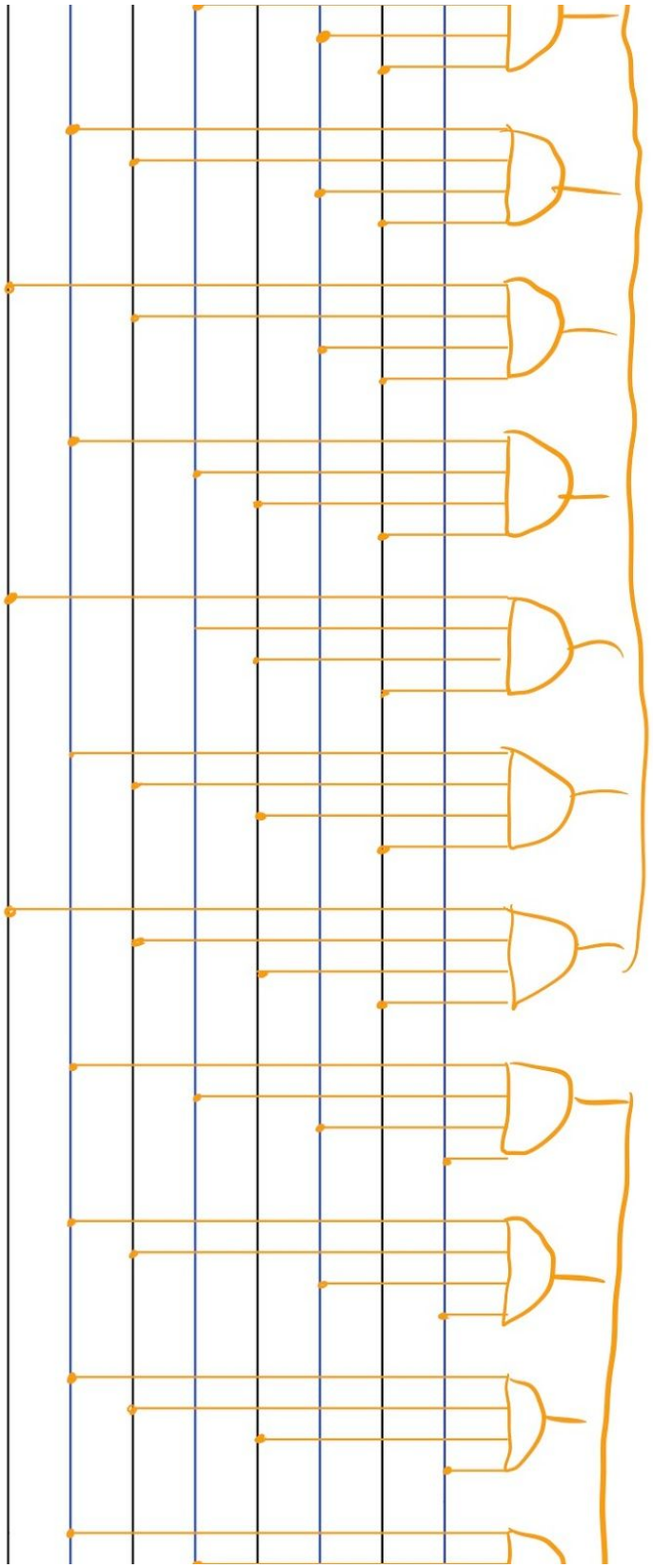

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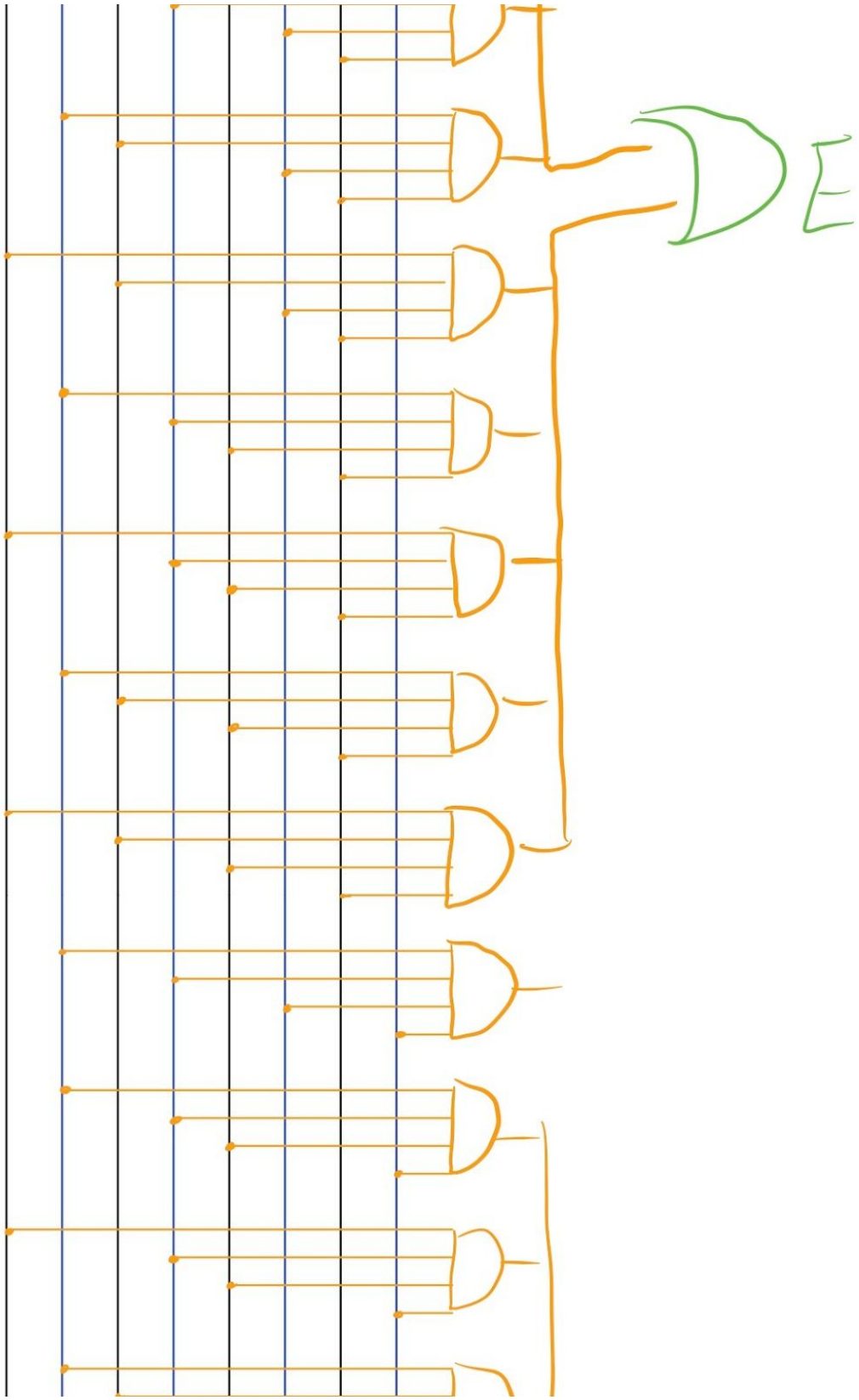

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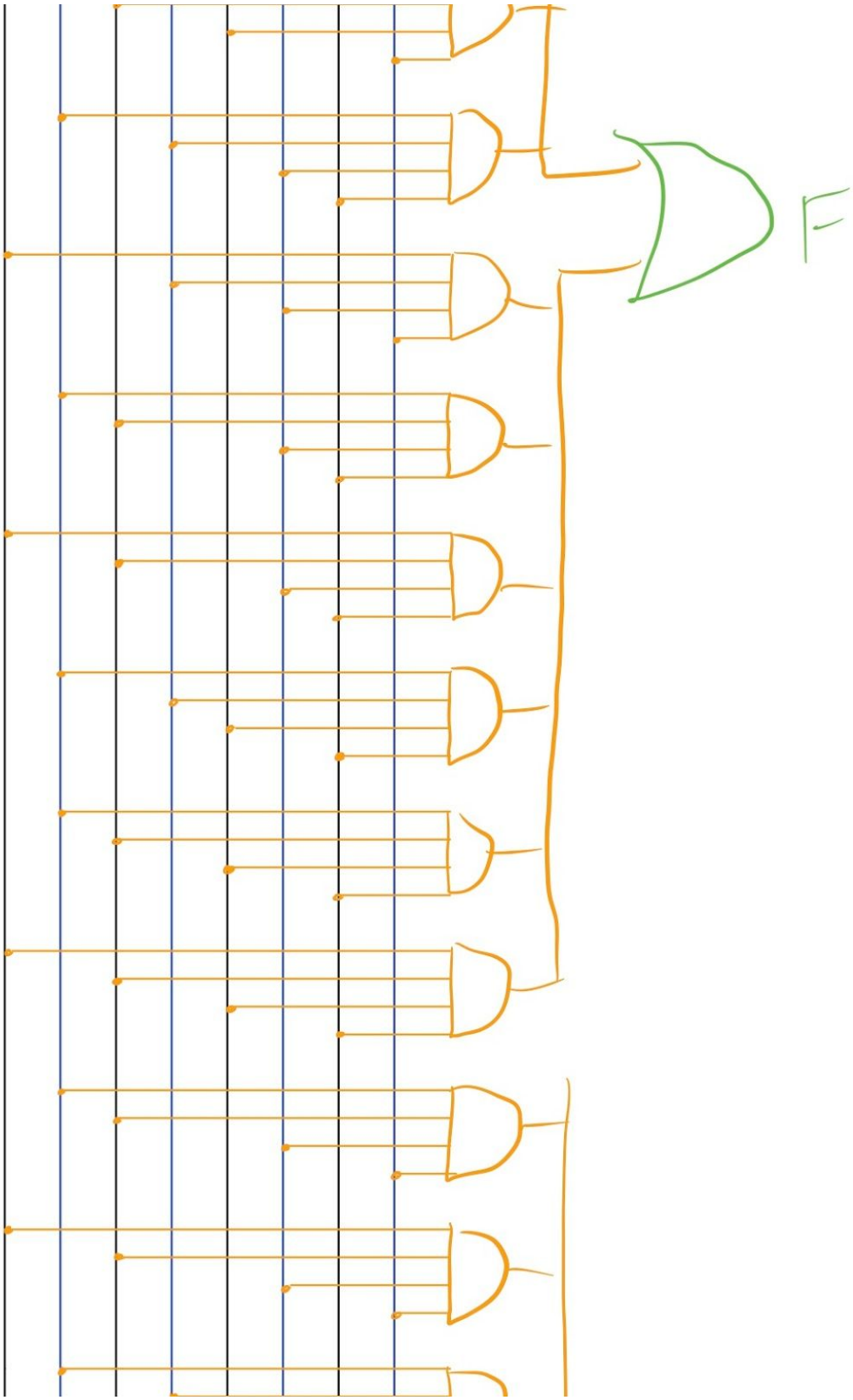

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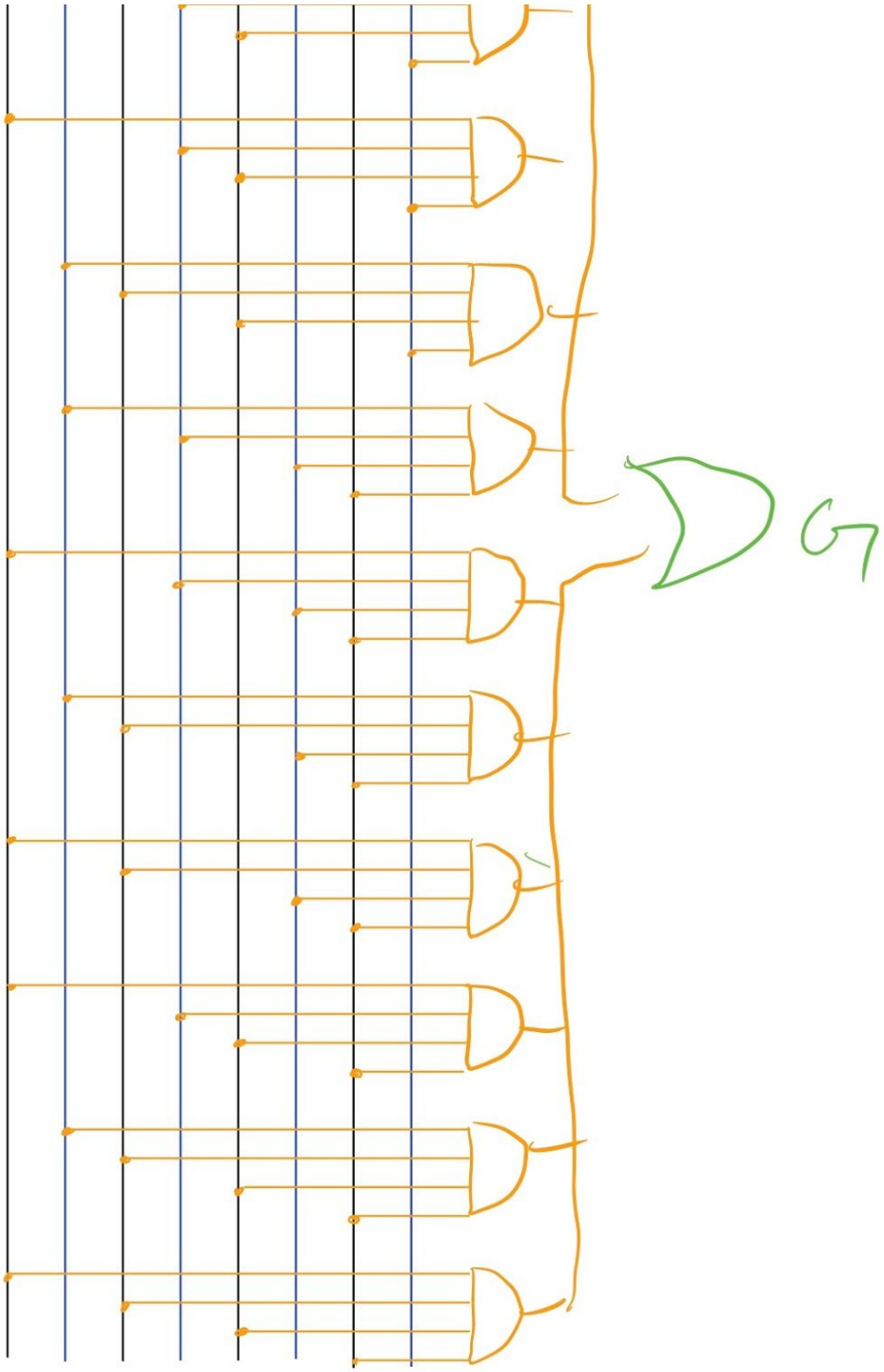

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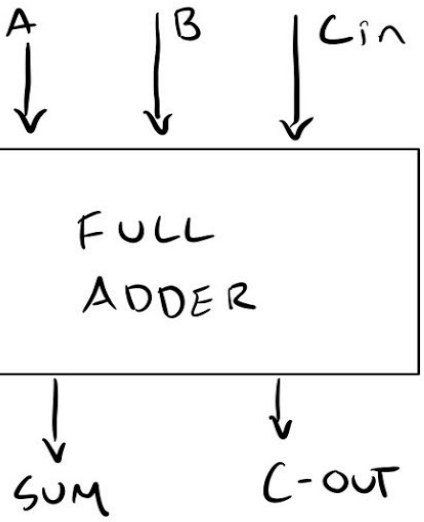
Truth table for full adder, schematic

a)

Input A	Input B	Input C	OUTPUT C-OUT	OUTPUT SUM
0	0	0	—	—
0	0	1	—	$\bar{A}\bar{B}C$
0	1	0	—	$\bar{A}B\bar{C}$
0	1	1	$\bar{A}BC$	—
1	0	0	—	$A\bar{B}\bar{C}$
1	0	1	$A\bar{B}C$	—
1	1	0	$AB\bar{C}$	—
1	1	1	ABC	ABC



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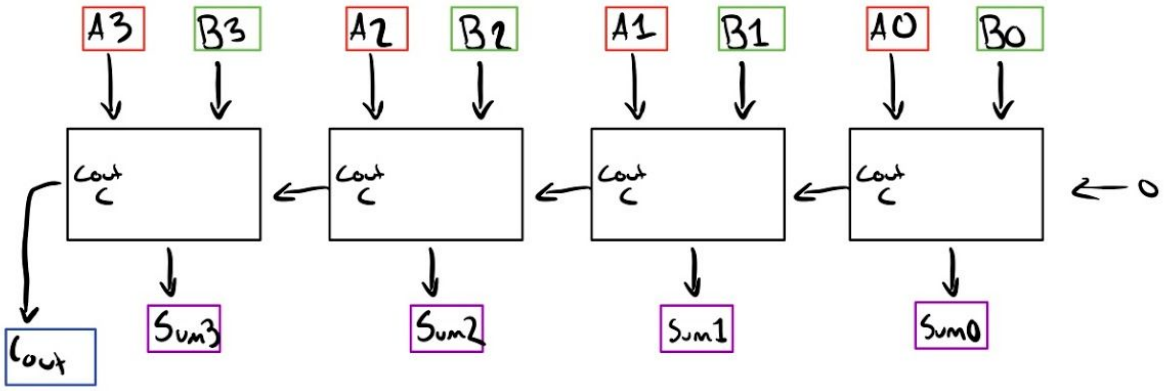
e)



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