



North South University

Department of Electrical & Computer Engineering

Project

19Z20S0

Submitted By:

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Course: CSE231

Section: 4

Submitted To:

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①

CSE 231

① Truth Table

19Z2050

Input				Output						
	x	y	z	a	b	c	d	e	f	g
1	0	0	0	0	1	1	0	0	0	0
9	0	0	1	1	1	1	1	0	1	1
Z	0	1	0	1	1	0	1	1	0	1
2	0	1	1	1	1	0	1	1	0	1
0	1	0	0	1	1	1	1	1	1	0
5	1	0	1	1	0	1	1	0	1	1
0	1	1	0	1	1	1	1	1	1	0
x	1	1	1	x	x	x	x	x	x	x

② k-map

	00	01	11	10
0	0	1	1	1
1	1	1	x	1

$$a = Z + Y + X \text{ (SOP)}$$

$$\rightarrow a = (X + Y + Z) \text{ (POS)}$$

	00	01	11	10
0	1	1	1	1
1	1	0	x	1

$$b = X' + Z' \text{ (SOP)}$$

$$\rightarrow b = (X' + Z') \text{ (POS)}$$

	00	01	11	10
0	1	1	0	0
1	1	1	x	1

$$c = Y' + X \text{ (SOP)}$$

$$c = (X + Y') \text{ (POS)}$$

	00	01	11	10
0	0	1	1	1
1	1	1	x	1

$$d = X + Y + Z \text{ (SOP)}$$

$$\rightarrow d = (X + Y + Z) \text{ (POS)}$$

	00	01	11	10
0	0	0	1	1
1	1	0	x	1

$$e = Y + XZ' \text{ (SOP)}$$

$$e = (X + Y)(Y + Z') \text{ (POS)}$$

	00	01	11	10
0	0	1	0	0
1	1	1	x	1

$$f = X + Y'Z \text{ (SOP)}$$

$$f = (X + Z)(X + Y') \text{ (POS)}$$

	00	01	11	10
0	0	1	1	1
1	0	1	x	0

$$g = Z + X'Y \text{ (SOP)}$$

$$g = (Y + Z)(X' + Z)$$

	00	01	11	10
0	0	1	0	0
1	1	1	x	1

(2)

③ Simplified Equation (SOP & POS)

Simplified Equation SOP	Simplified Equation POS
$a = x + y + z$	$a = (x + y + z)$
$b = x' + z'$	$b = (x' + z')$
$c = x + y'$	$c = (x + y')$
$d = x + y + z$	$d = (x + y + z)$
$e = y + xz'$	$e = (x + y)(y + z')$
$f = x + y'z$	$f = (x + z)(x + y')$
$g = z + x'y$	$g = (y + z)(x' + z)$

④ Generalized SOP circuit with basic gates

$$\# a = x + y + z$$

$$a = \sum(1, 2, 3, 4, 5, 6)$$

$$= xy'z' + x'y'z + xy'z' + x'y'z + x'y'z' + x'y'z$$

$$\# b = x' + z'$$

$$b = \sum(0, 1, 2, 3, 4, 6)$$

$$= x'y'z + x'y'z' + x'y'z + x'y'z' + x'y'z' + x'y'z'$$

$$\# c = y' + x$$

$$c = \sum(0, 1, 4, 5, 6)$$

$$= xy'z + xy'z' + x'y'z + x'y'z' + xy'z'$$

③

$$\# d = x + y + z$$

$$d = \Sigma(1, 2, 3, 4, 5, 6)$$

$$= xyz' + xy'z + x'y'z + x'yz + x'y'z + x'y'z$$

$$\# e = y + xz'$$

$$e = \Sigma(2, 3, 4, 6)$$

$$= xyz' + x'y'z + x'y'z + xy'z'$$

$$\# f = x + y'z$$

$$f = \Sigma(1, 4, 5, 6)$$

$$= xyz' + xy'z + xy'z' + x'y'z$$

$$g = z + xy$$

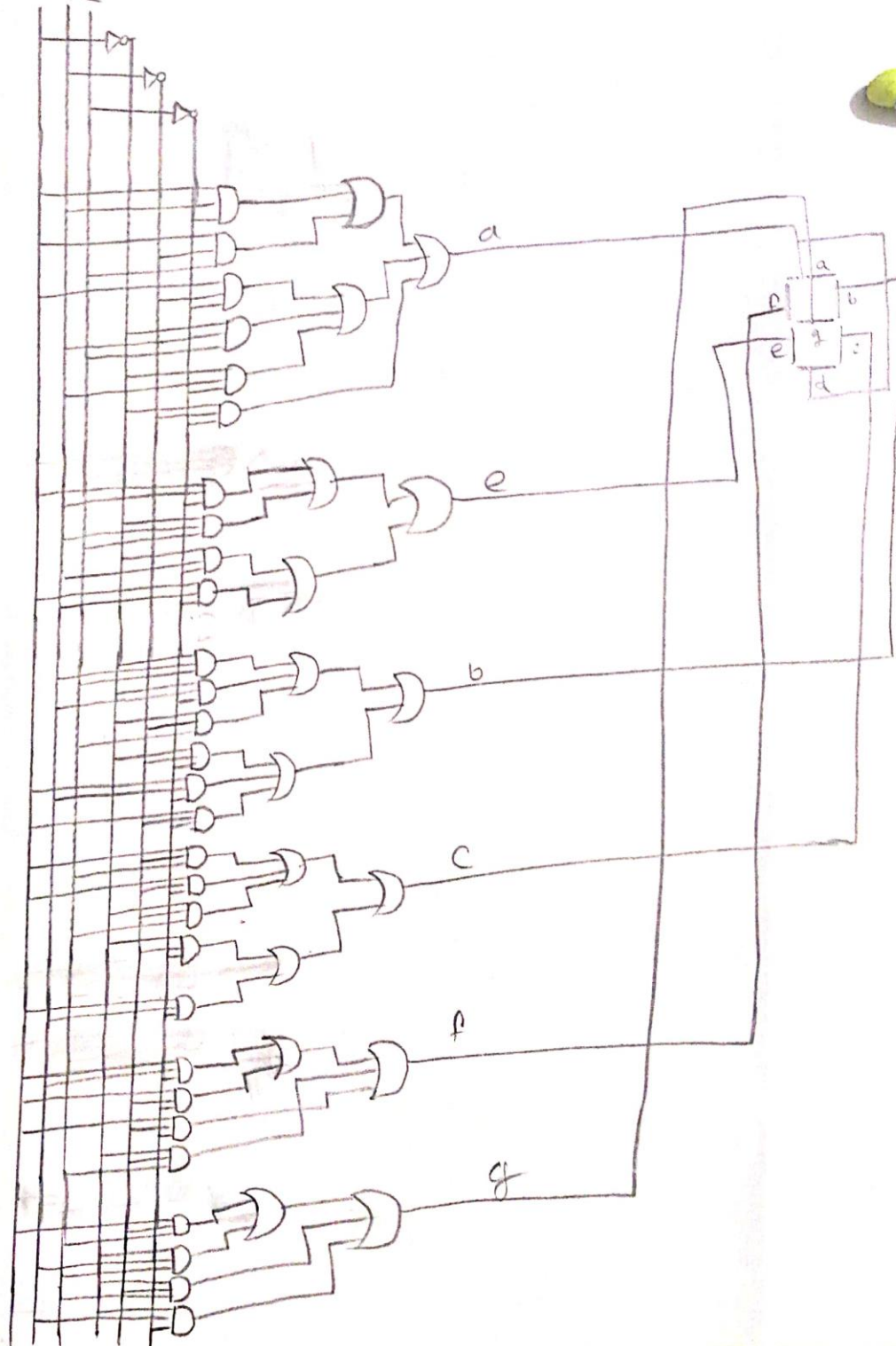
$$g = \sum(1, 2, 3, 5)$$

$$= xy'z + x'y'z + x'y'z' + x'y'z'$$

Generalized SOP circuit with basic gates

(9)

x 12



⑤ Generalized POS Circuit with Basic gates

$$a = \pi(0) = (x + y + z)$$

$$b = \pi(5) = (x' + y + z')$$

$$c = \pi(2, 3)$$

$$= (x + y' + z)(x + y' + z')$$

$$d = \pi(0) = (x + y + z)$$

$$e = \pi(0, 1, 5)$$
$$= (x + y + z)(x + y + z')(x' + y + z')$$

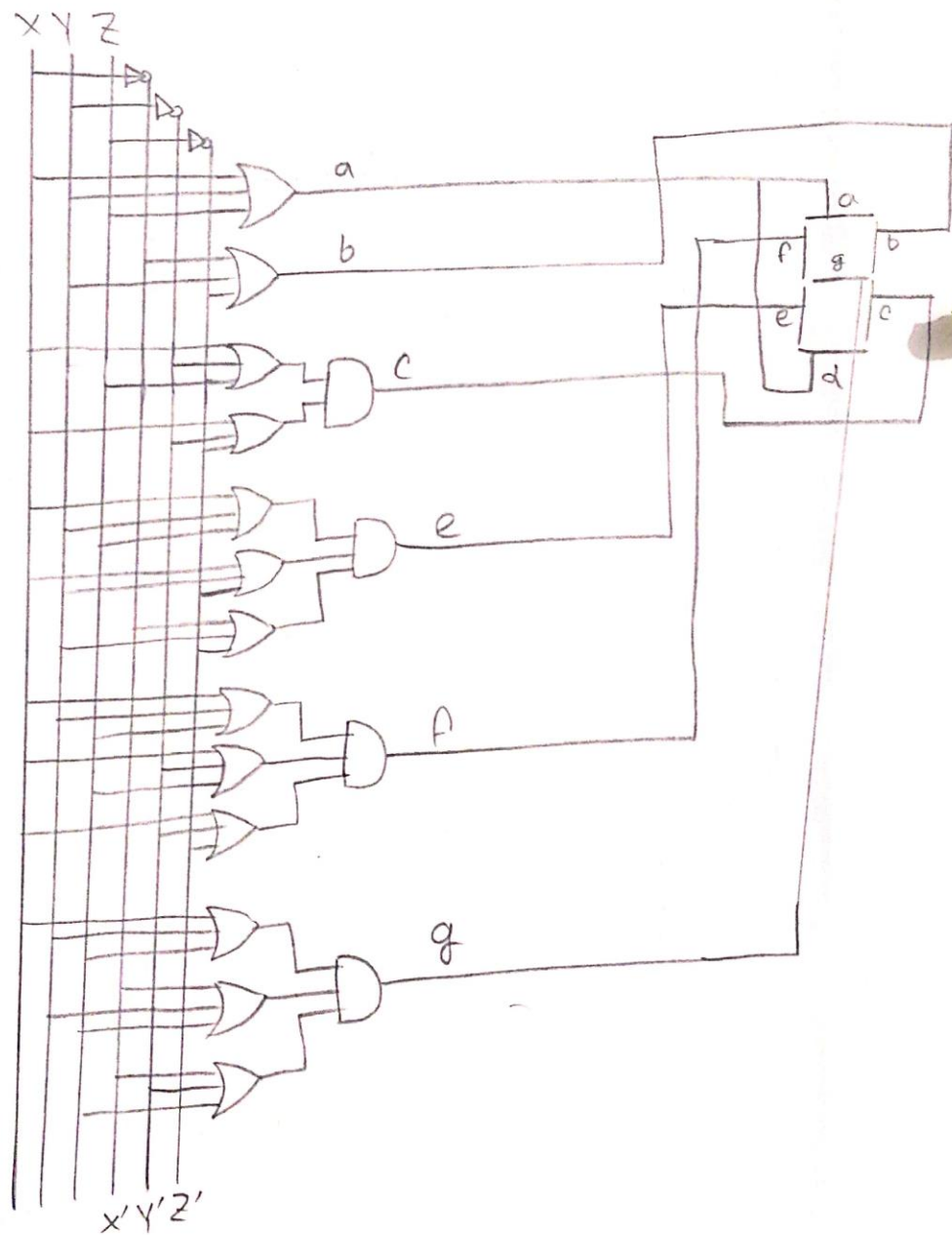
$$f = \pi(0, 2, 3)$$

$$= (x + y + z)(x + y' + z)(x + y' + z')$$

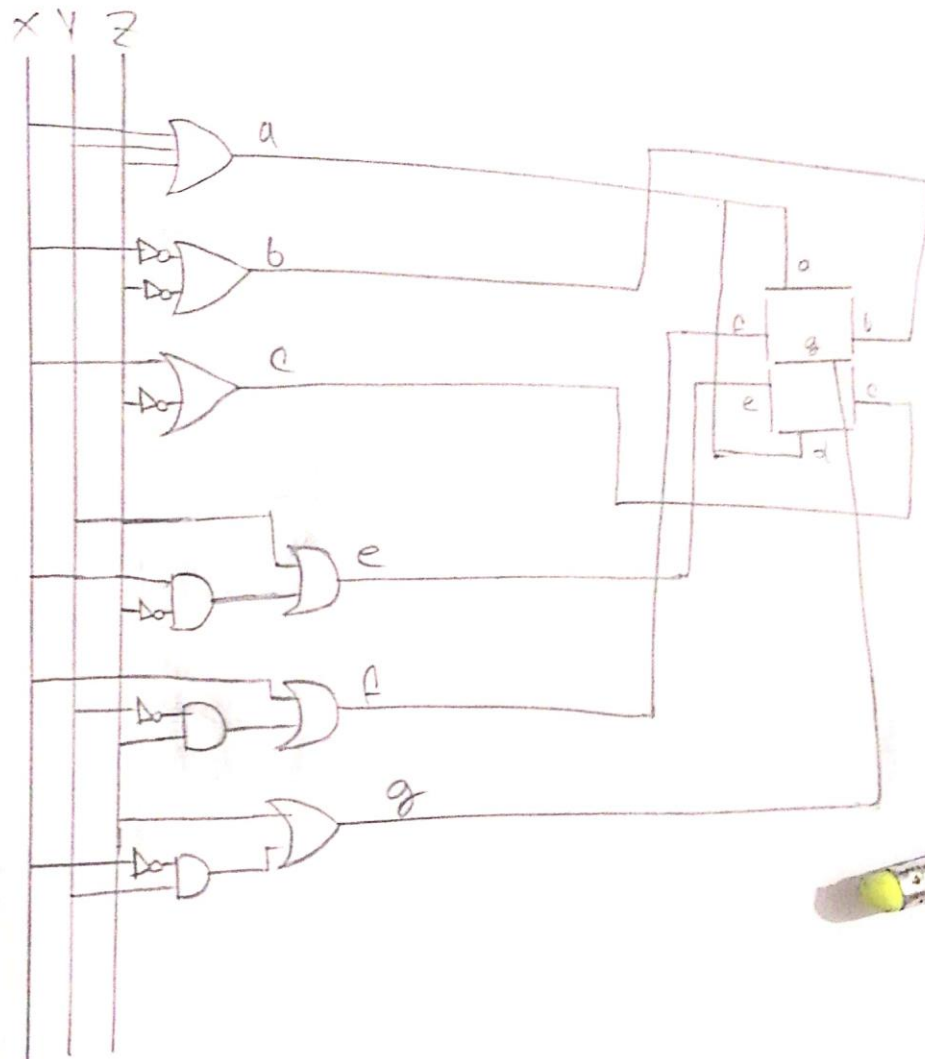
$$g = \pi(0, 4, 6)$$

$$= (x + y + z)(x' + y + z)(x' + y' + z)$$

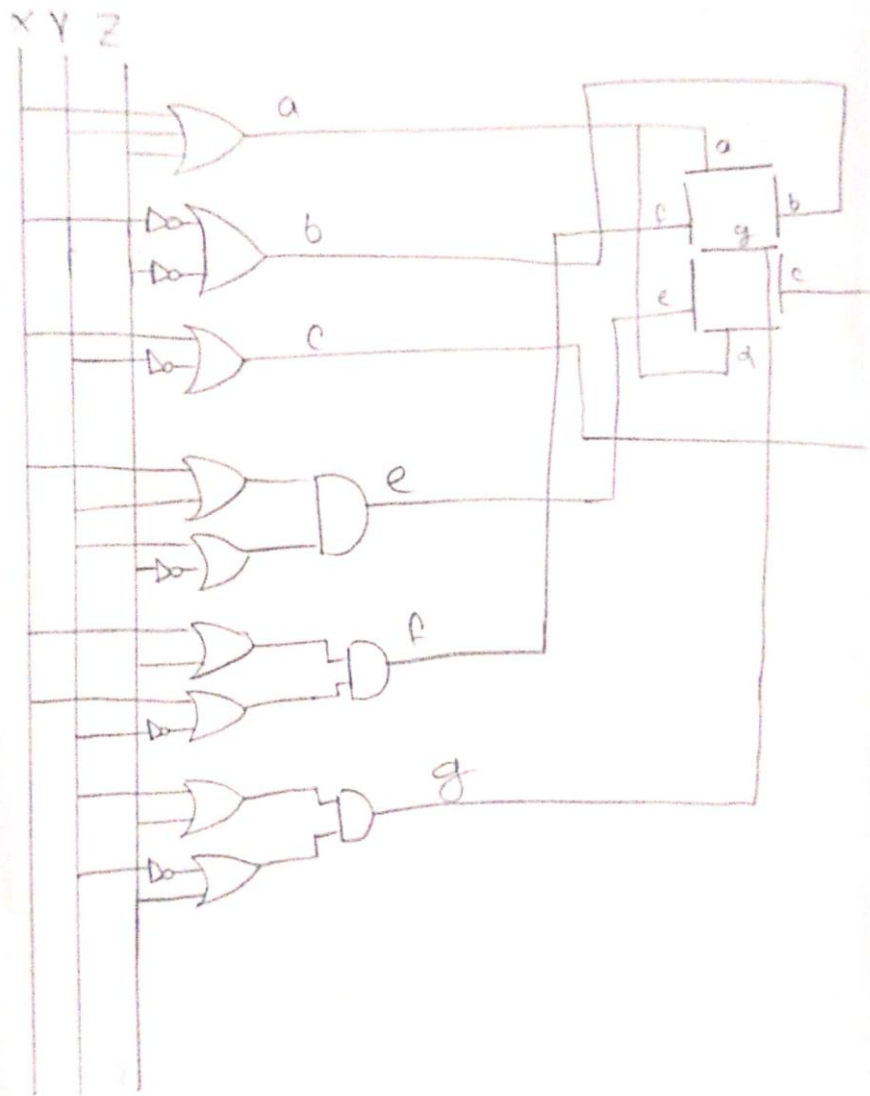
#Generalized POS circuit with basic gates



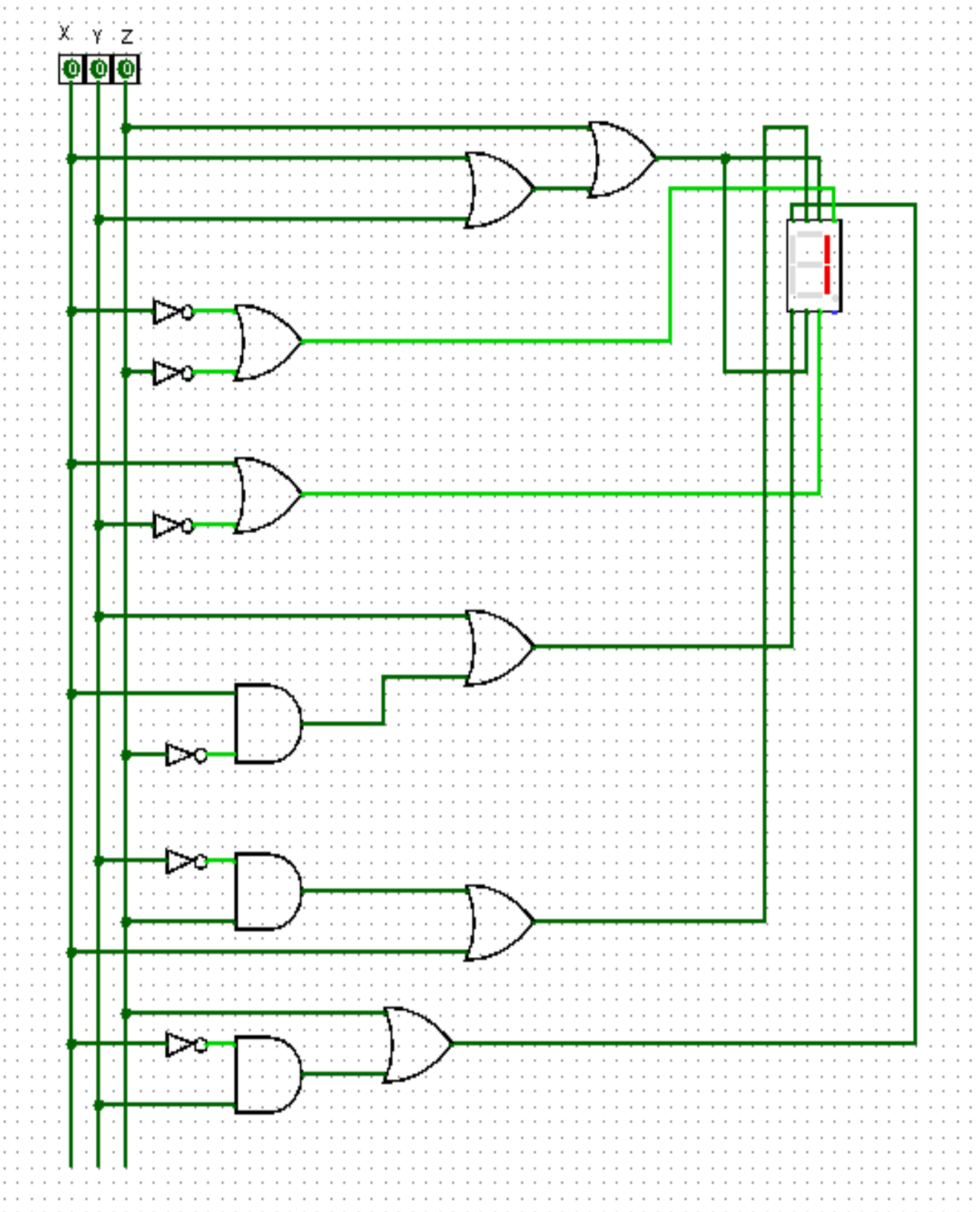
⑥ Simplified SOP circuit with basic gates



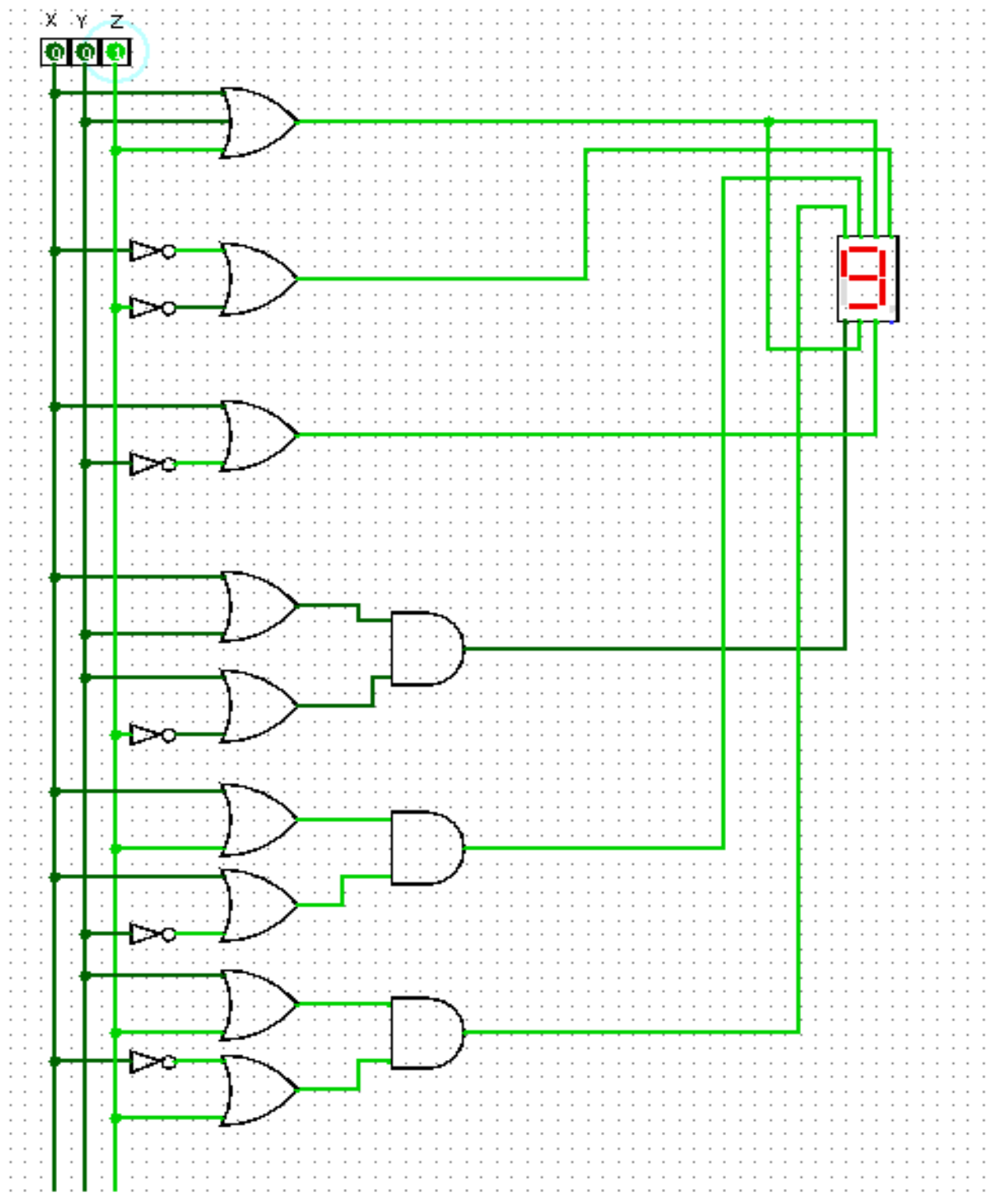
⑧ Simplified ~~the~~ circuit with basic gates



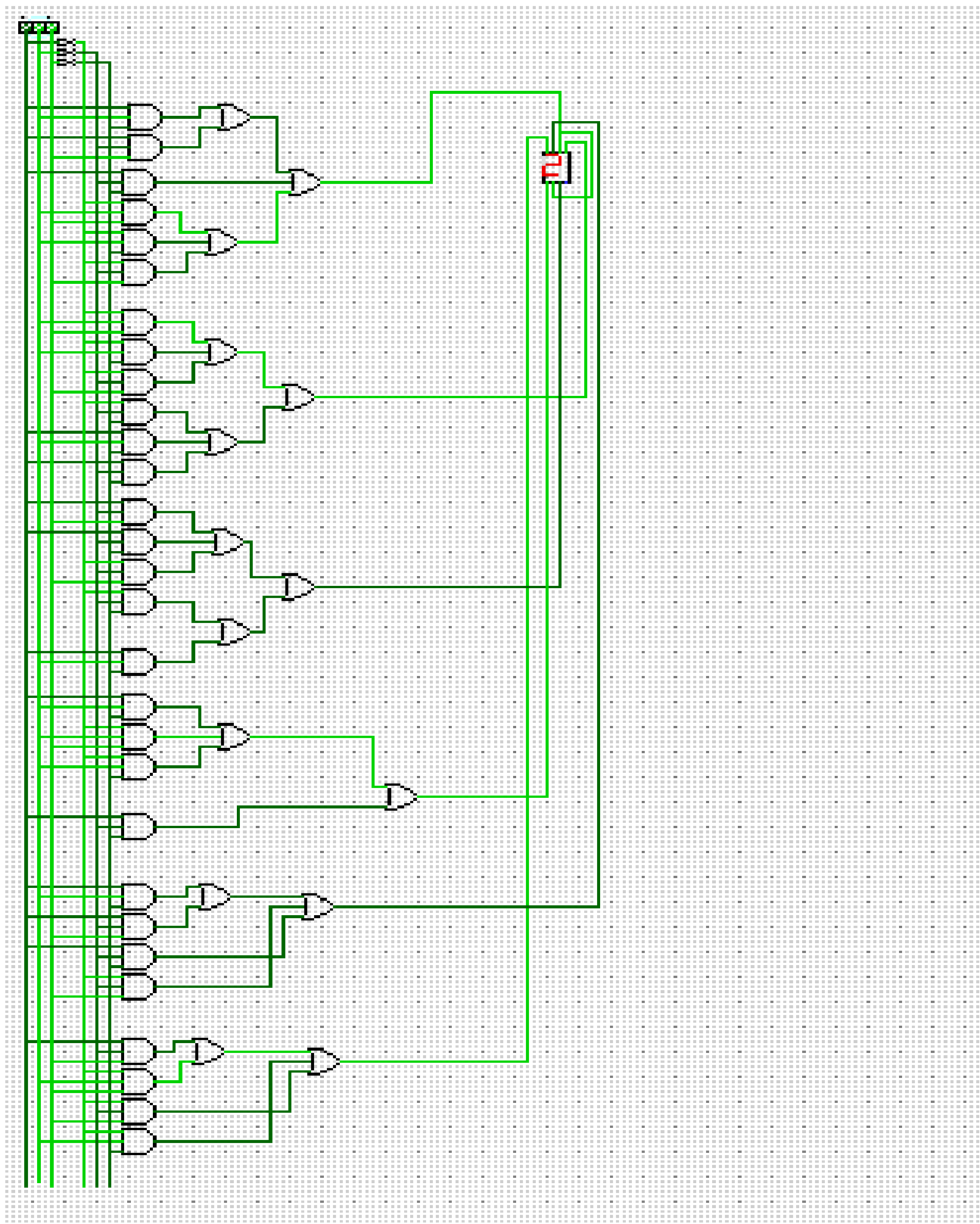
Simplified SOP Circuit using Basic Gates in Logisim:



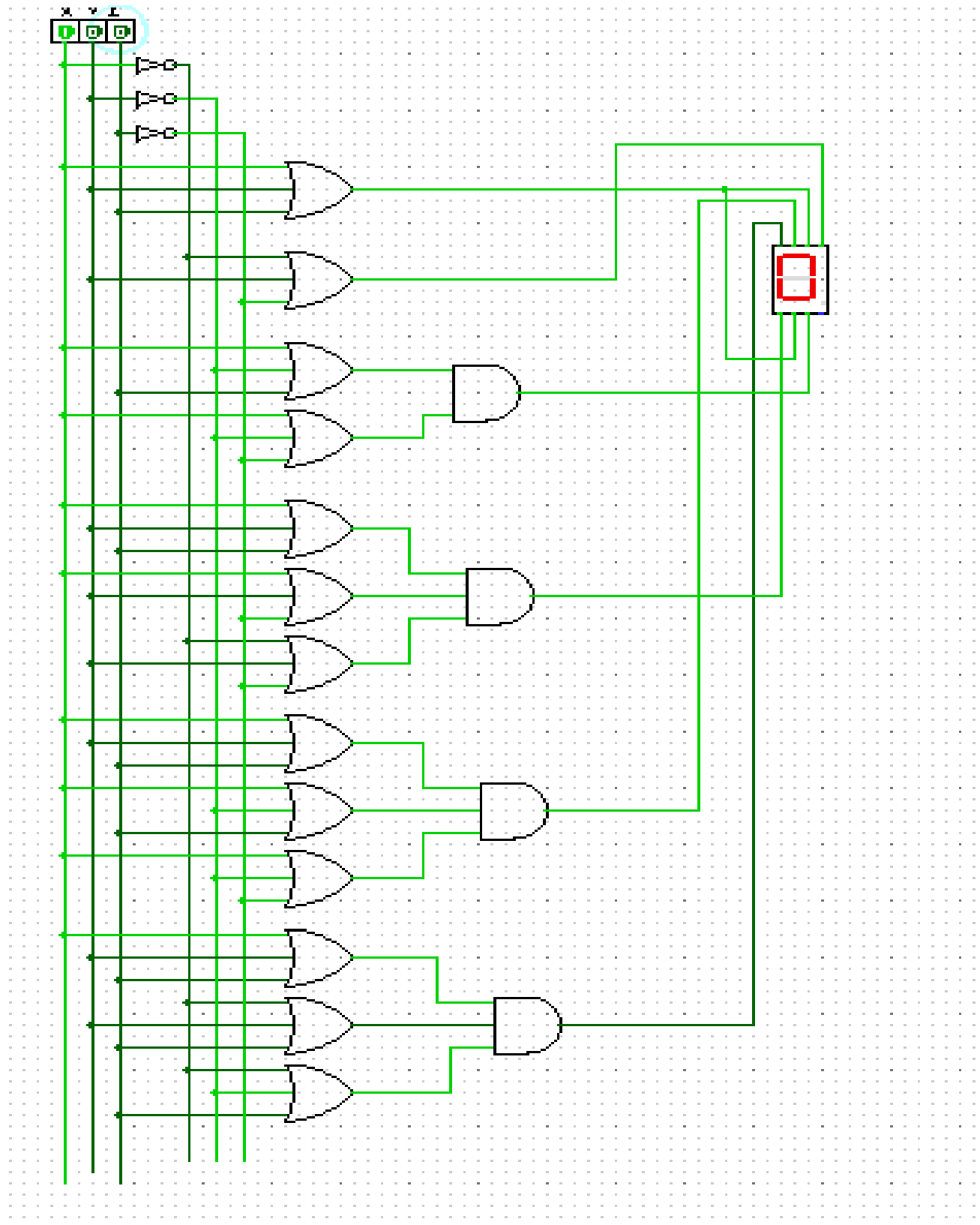
Simplified POS Circuit using Basic Gates in Logisim:



Generalized SOP circuit with basic gates in Logisim:



Generalized POS circuit with basic gates in Logisim:



Generalized SOP circuit with D-FlipFlop in Logisim:

