1)

a.

A	B	C	X
0	0	0	0
1	0	0	0
1	1	0	0
1	0	1	0
0	1	0	0
0	0	1	0
0	1	1	0
1	1	1	1

b.

$$X = \underbrace{(A \wedge B) \vee C}$$

A	B	C	$A \wedge B$	$(A \wedge B) \vee C$
0	0	0	0	0
1	0	0	0	0
1	1	0	1	1
1	0	1	0	1
0	1	0	0	0
0	0	1	0	1
0	1	1	0	1
1	1	1	1	1

2)

$$\overset{0}{\bar{A}} \vee \overset{1}{\bar{B}} \vee \overset{0}{\bar{C}} \vee \overset{0}{\bar{D}}$$

A	B	C	D	$\overline{(A \wedge B \wedge C \wedge D)}$ ← demorgans
1	0	1	1	1

part 2)

Since we have + (or), this will always be true

1) a. $A + A \cdot B = A + (A \cdot B) = A$

b.) $(A \cdot (B+C) + B \cdot C) = AB + AC + BC$

$= C(B + A + B) = C(B+A)$

2)

A	B	C	$B \land C$	$B \lor C$	$(A \land ((B \lor C) \lor (B \land C)))$
0	0	0	0	0	0
1	0	0	0	0	0
1	1	0	0	1	1
1	0	1	0	1	1
0	1	0	0	1	0
0	0	1	0	1	0
0	1	1	1	1	0
1	1	1	1	1	1

A	B	C	$((B \lor A) \land C)$
0	0	0	0
1	0	0	0
1	1	0	0
1	0	1	1
0	1	0	0
0	0	1	1
0	1	1	1
1	1	1	1

Part 3

1)

AB \ CD	00	01	11	10
00	0	1	0	1
01	0	0	0	0
11	0	0	0	1
10	0	0	0	0

2) $(\bar{A}\cdot\bar{B}\cdot\bar{C}\cdot D)+(\bar{A}\cdot\bar{B}\cdot C\cdot\bar{D})+(A\cdot B\cdot C\cdot\bar{D})$

Part 4)

P_0)

A_1A_0 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	0	1	1	0
11	0	1	1	0
10	0	0	0	0

$P_0 = A_0 \cdot B_0$

P_1)

A_1A_0 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	0	1	0	1
10	0	1	1	0

$P_1 = (\bar{A_1} \cdot A_0 \cdot B_1) + (A_0 \cdot B_1 \cdot \bar{B_0}) + (A_1 \cdot \bar{A_0} \cdot B_0) + (A_1 \cdot \bar{B_1} \cdot B_0)$

P_2)

A_1A_2 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	0	1
10	0	0	1	1

$P_2 = (A_1 \cdot \bar{A_0} \cdot B_1) + (A_1 \cdot B_1 \cdot \bar{B_0})$

P_3)

A_1A_0 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	0	0	1	0
10	0	0	0	0

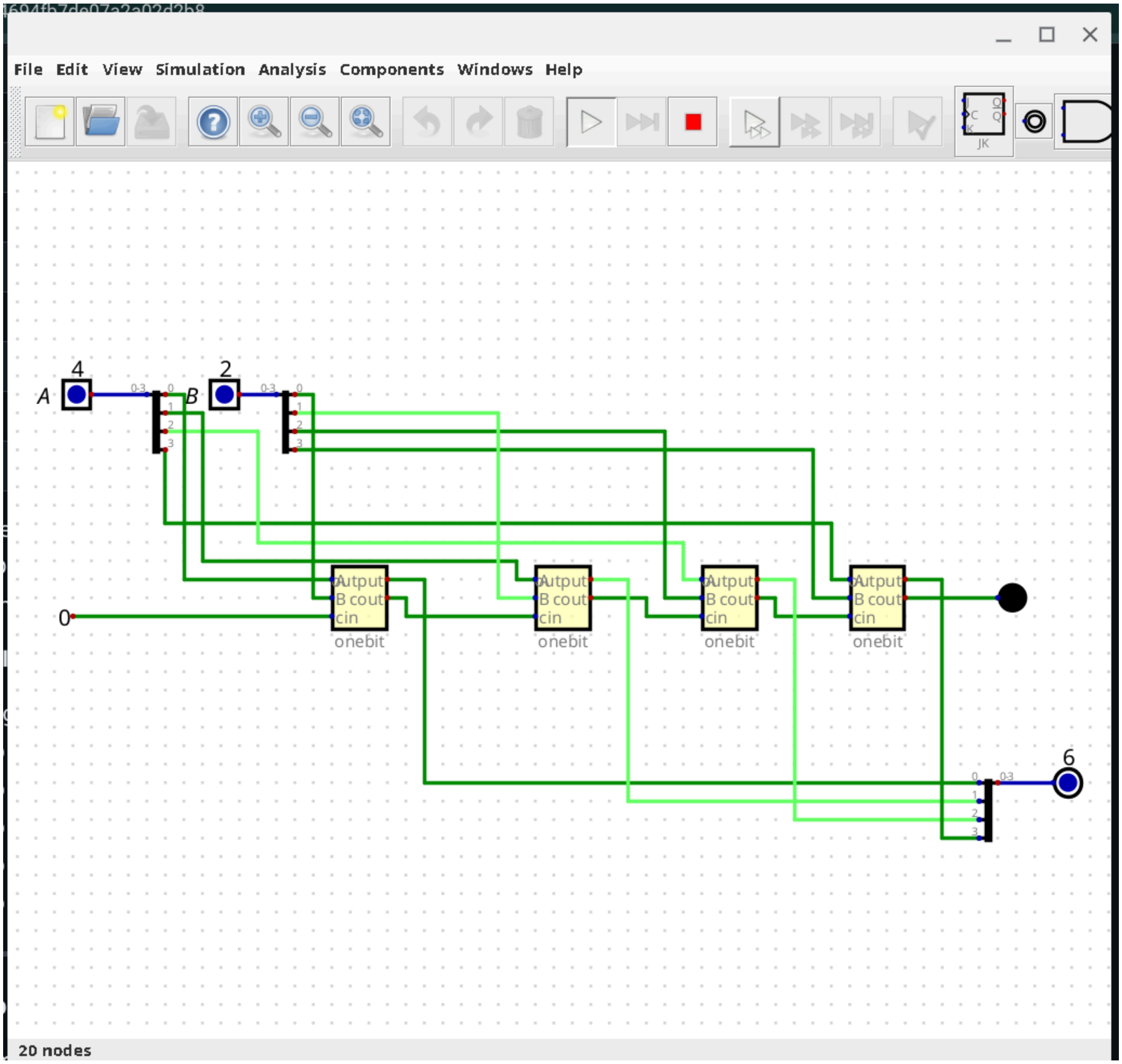
$P_3 = (A_1 \cdot A_0 \cdot B_1 \cdot B_0)$

Part 4

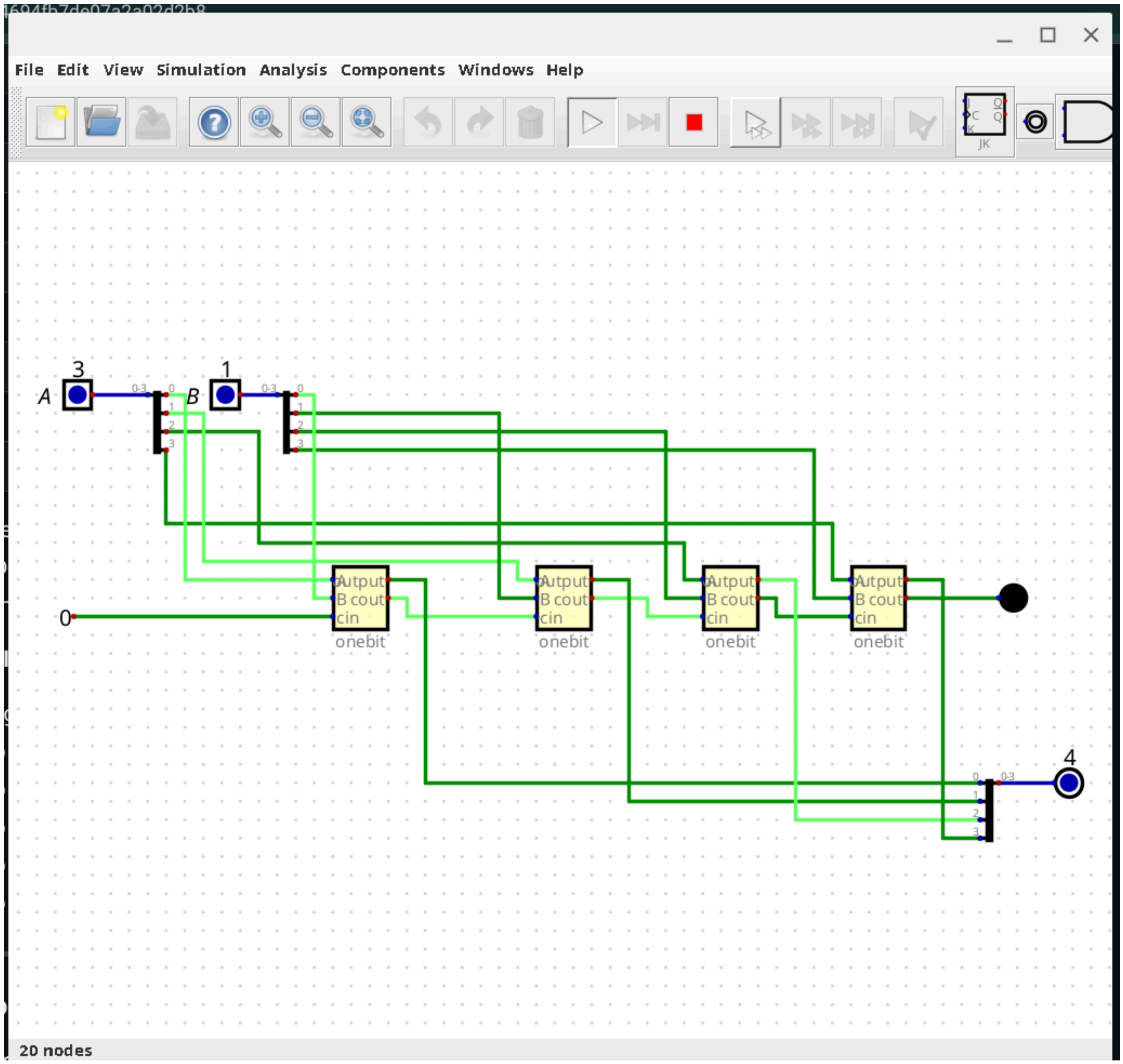
P1) 4)

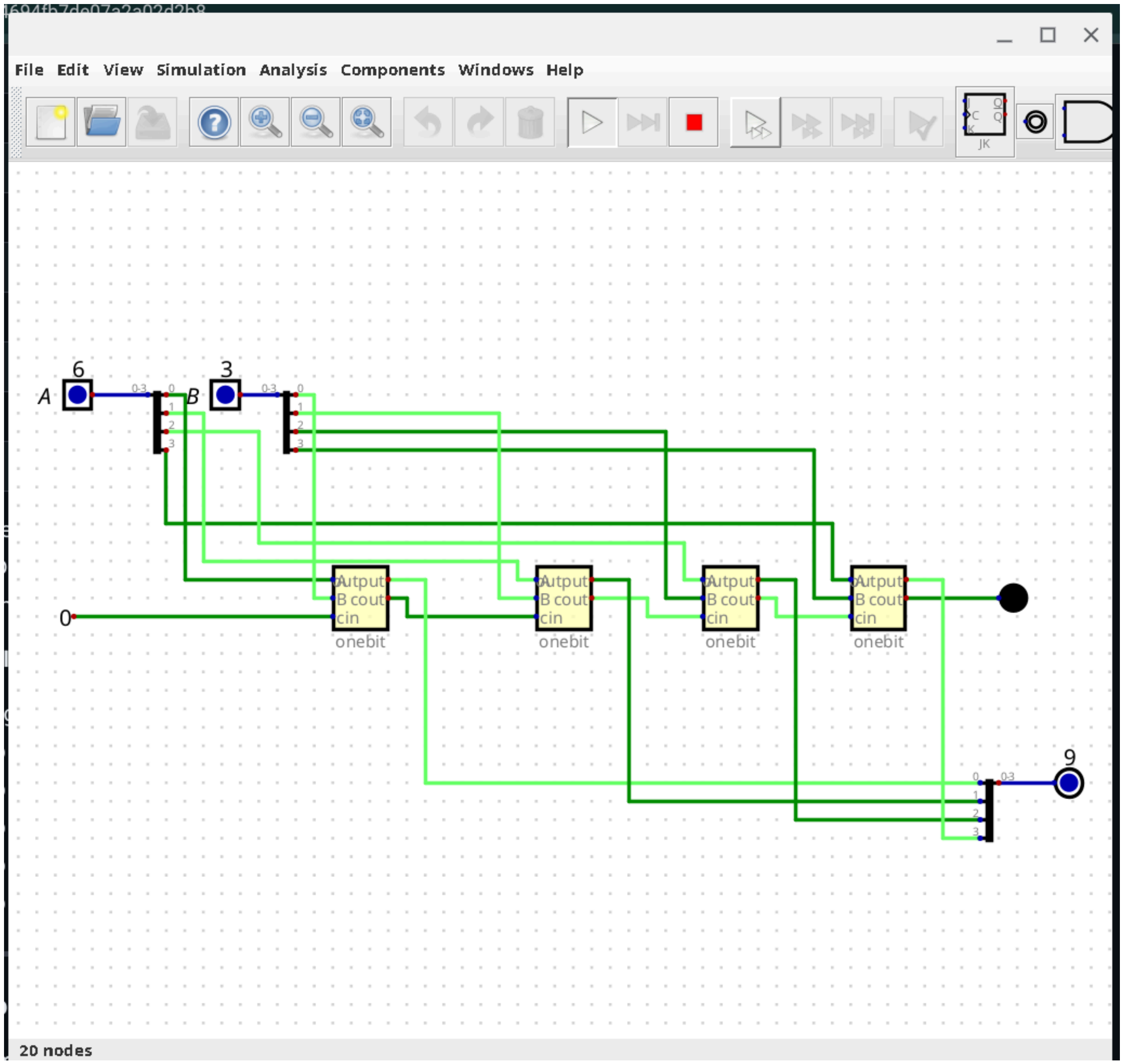
A	B	Cin	Sum/output	Cout
0	0	0	0	0
1	0	0	1	0
1	1	0	0	1
1	0	1	0	1
0	1	0	1	0
0	0	1	1	0
0	1	1	0	1
1	1	1	1	1

$$(A\cdot\overline{B}\cdot\overline{C_{in}}) + (\overline{A}\cdot B\cdot\overline{C_{in}}) + (\overline{A}\cdot\overline{B}\cdot C_{in}) + (A\cdot B\cdot C_{in})$$



File Edit View Simulation Analysis Components Windows Help
A
4
B
2
0
Output
B cout
cin
onebit
6
20 nodes


File Edit View Simulation Analysis Components Windows Help
JK
A
3
B
1
0
Output
B cout
cin
onebit
4
20 nodes



File Edit View Simulation Analysis Components Windows Help
6
A
3
B
0
Output
B cout
cin
onebit
9
20 nodes