HW 2 - John Akujobi

Owner	J John Akujobi
Type	Homework
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Status	Not started

💡 Compiled using markdown with Notion
Schematics created using Circuitverse

A

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

B

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

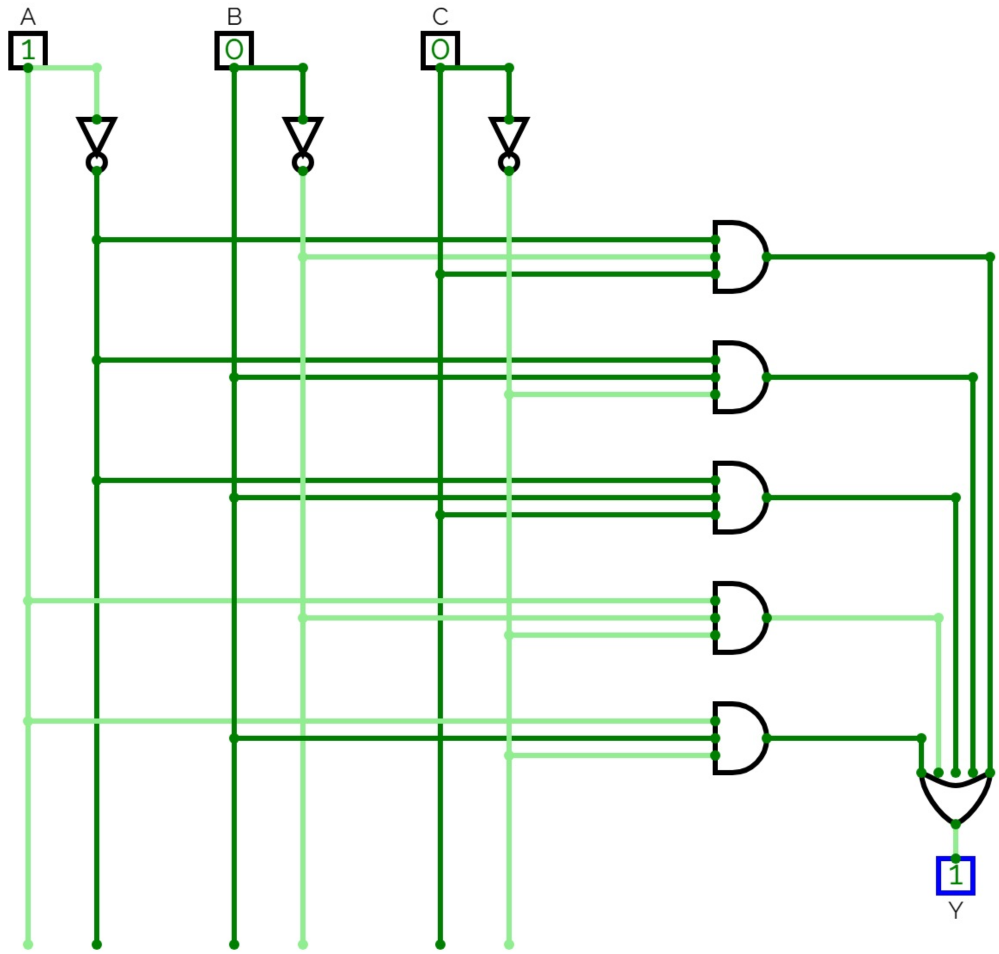
C

A	B	C	Y
0	0	0	0
0	0	1	1

0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

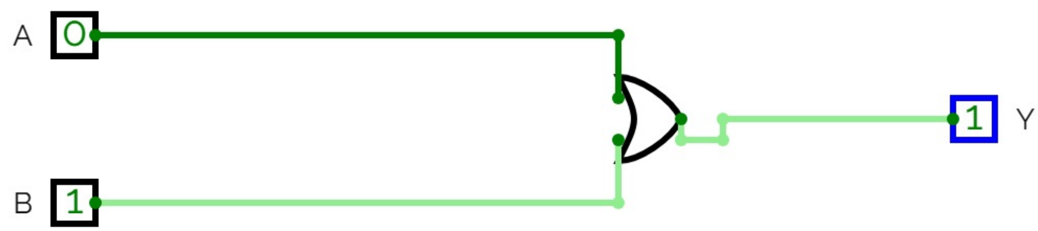
For the above truth tables

1. For the above truth tables
    a. Write in sigma notation
        i. A → `Y =` `Σ (1,2,3)`
        ii. B → `Y =` `Σ (1,2,3,4,6)`
        iii. C → `Y =` `Σ (1,6,7)`
    b. Write in canonical sum-of-products form
        i. A → `Y = A’B + AB’ + AB`
        ii. B → `Y = A’.B’.C + A’.B.C’ + A’.B.C + A.B’.C’ + A.B.C’`
        iii. C → `Y = A’.B’.C + A.B.C’ + A.B.C`
    c. Draw the schematic for (b)



Schematic for B

2. For the above truth tables
   a. Write in Pi notation
      i. A → `Y = Π(0)`
      ii. B → `Y = Π(0,5,7)`
      iii. C → `Y = Π (0,2,3,4,5)`
   b. Write in the canonical product of sums form
      i. A → `Y = A+B`
      ii. B → `Y = (A+B+C).(A′+B+C′).(A′+B′+C′)`
      iii. C → `Y = (A+B+C).(A+B′+C).(A+B′+C′).(A′+B+C).(A′+B+C′)`
   c. Draw the schematic for (a)



Schematic for A

3. For truth table c minimize using Boolean algebra theorems. Label each theorem/step used.

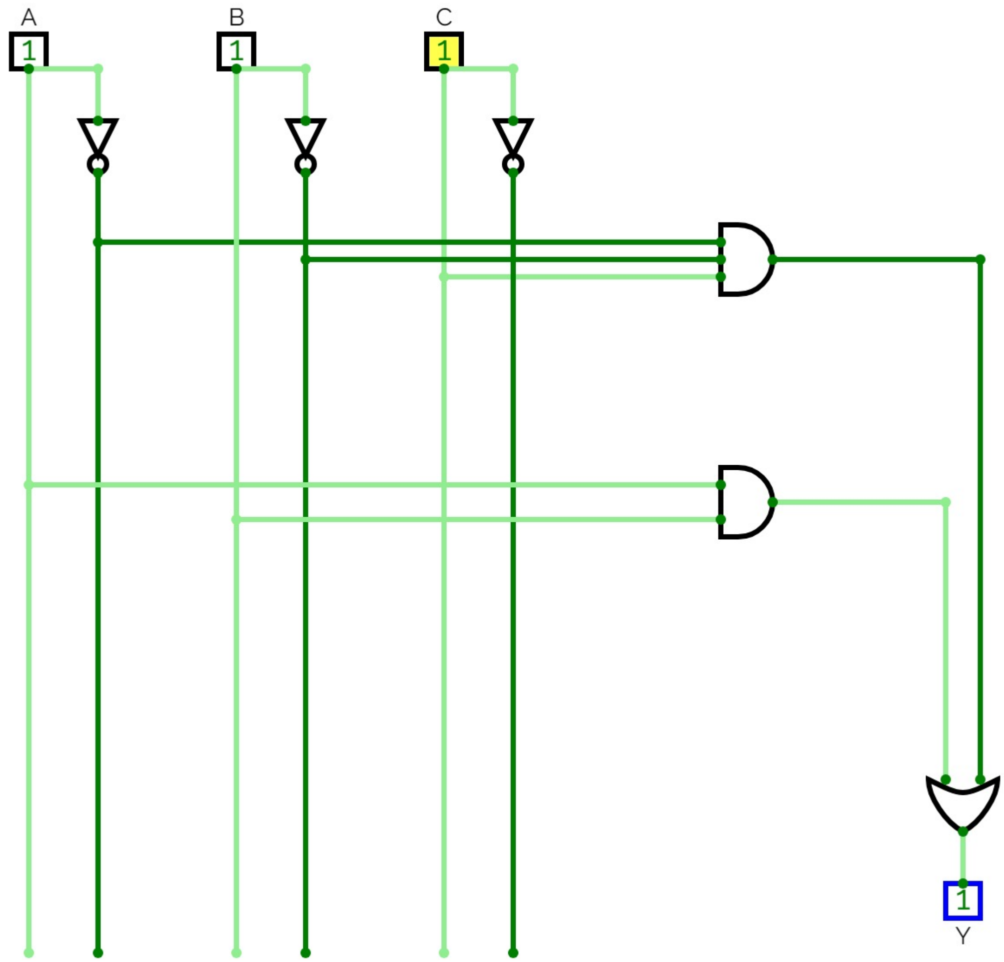
- `Y = A’.B’.C + A.B`

```
Group the terms with common factors:
Y = A’.B’.C + A.B.(C’ + C)

Identity law:
Y = A’.B’.C + A.B.(1)

Simplify:
Y = A’.B’.C + A.B
```

1. Draw the schematic

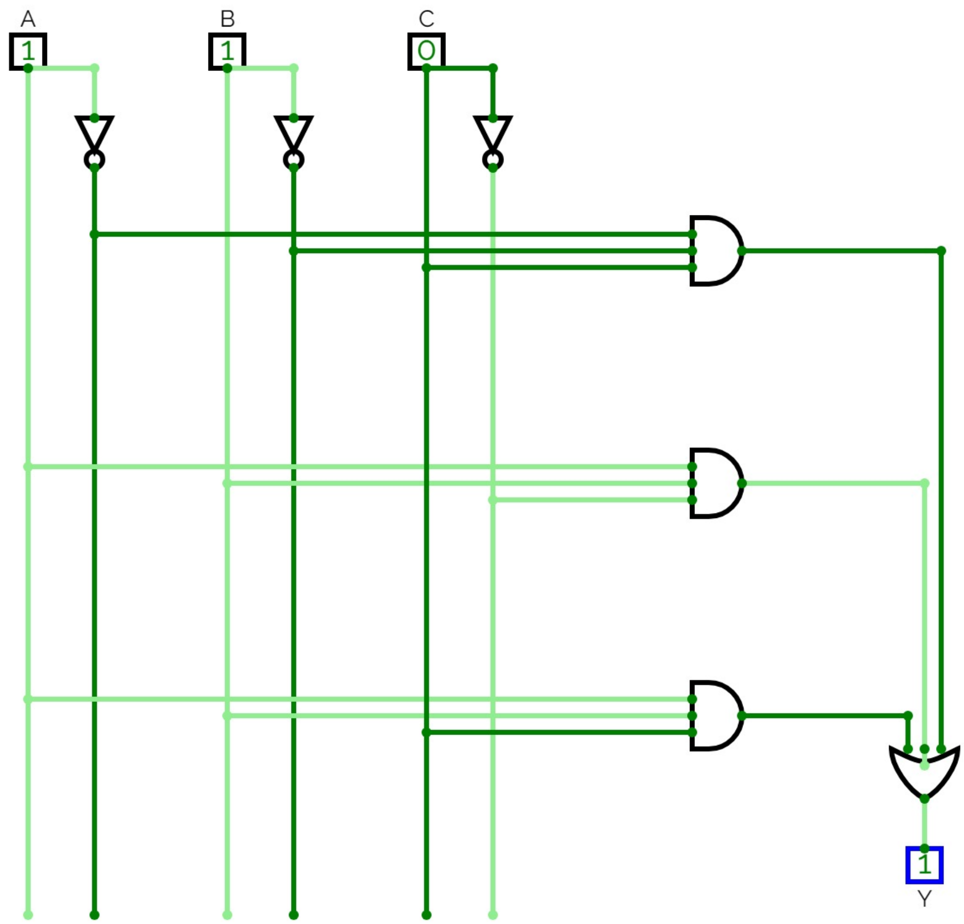


Minimized version of B

2. Compare the cost to the canonical form

    a. Minimized form ⇒ `11`

    b. Original Canonical Form ⇒ `17`



Canonical form

▼ A

A	B	Y	Min terms(SOP)	Max terms(POS)
0	0	0	A'B'	A+B
0	1	1	A'B	A+B'
1	0	1	AB'	A'+B
1	1	1	AB	A'+B'

Sigma Notation

- `Y =` `Σ (1,2,3)`
  - The rows that give Y=1

Canonical sum-of-products form

- `Y = A'B + AB' + AB`
    - These are the Min terms of the rows that give Y=1
    - And in the min terms, A is 0 while A' is 1

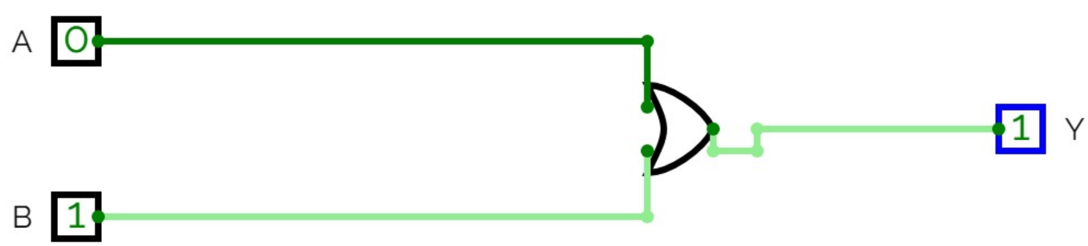
PI Notation

- `Y = Π(0)`
    - Since it's only the 0th row that gives y=0

Canonical Product of sums form

- `Y = A+B`
    - Max terms of the rows that give Y=0

Schematic Drawing



▼ B

A	B	C	Y	Min Terms	Max Terms
0	0	0	0	A'.B'.C'	A+B+C
0	0	1	1	A'.B'.C	A+B+C'
0	1	0	1	A'.B.C'	A+B'+C
0	1	1	1	A'.B.C	A+B'+C'
1	0	0	1	A.B'.C'	A'+B+C
1	0	1	0	A.B'.C	A'+B+C'
1	1	0	1	A.B.C'	A'+B'+C

1	1	1	0	A.B.C	A'+B'+C'

Sigma Notation

- `Y =` `Σ (1,2,3,4,6)`

Canonical sum-of-products form

- `Y = A′.B′.C + A′.B.C′ + A′.B.C + A.B′.C′ + A.B.C′`

PI Notation

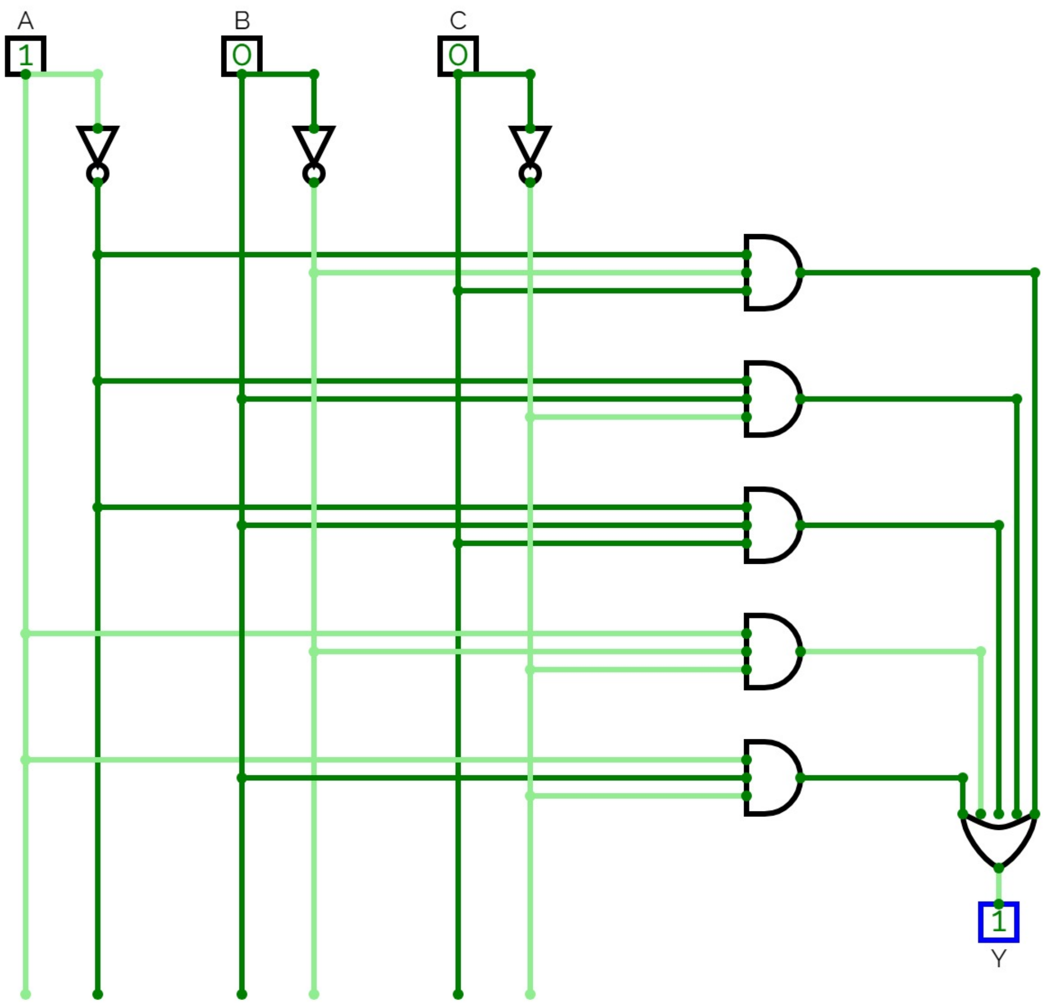
- `Y = Π(0,5,7)`

Canonical Product of sums form

- `Y = (A+B+C).(A′+B+C′).(A′+B′+C′)`

Schematic Drawing

B - Homework 1 - Digital Logic.cv



▼ C

A	B	C	Y	Min Terms	Max terms
0	0	0	**0**	A'.B'.C'	A+B+C
0	0	1	**1**	A'.B'.C	A+B+C'
0	1	0	**0**	A'.B.C'	A+B'+C
0	1	1	**0**	A'.B.C	A+B'+C'
1	0	0	**0**	A.B'.C'	A'+B+C
1	0	1	**0**	A.B'.C	A'+B+C'
1	1	0	**1**	A.B.C'	A'+B'+C

A	B	C	Y	Min Terms	Max terms
1	1	1	**1**	A.B.C	A’+B’+C’

Sigma Notation

- `Y = ` `Σ (1,6,7)`

Canonical sum-of-products form

- `Y = A′.B′.C + A.B.C′ + A.B.C`

PI Notation

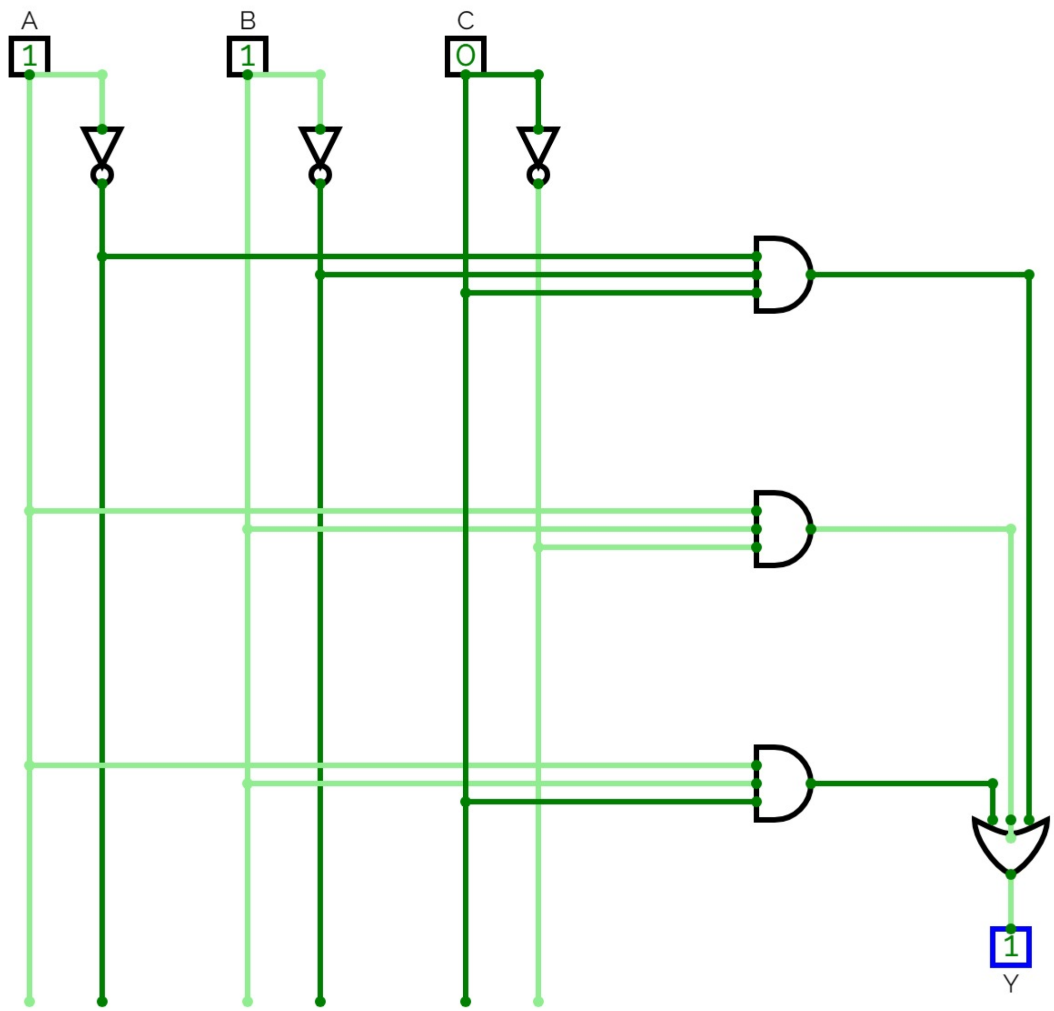
- `Y = Π (0,2,3,4,5)`

Canonical Product of sums form

- `Y = (A+B+C).(A+B′+C).(A+B′+C′).(A′+B+C).(A′+B+C′)`

Schematic Drawing

C - Digital Logic HW 1.cv



Minimized Boolean

- `Y = A’.B’.C + A.B`

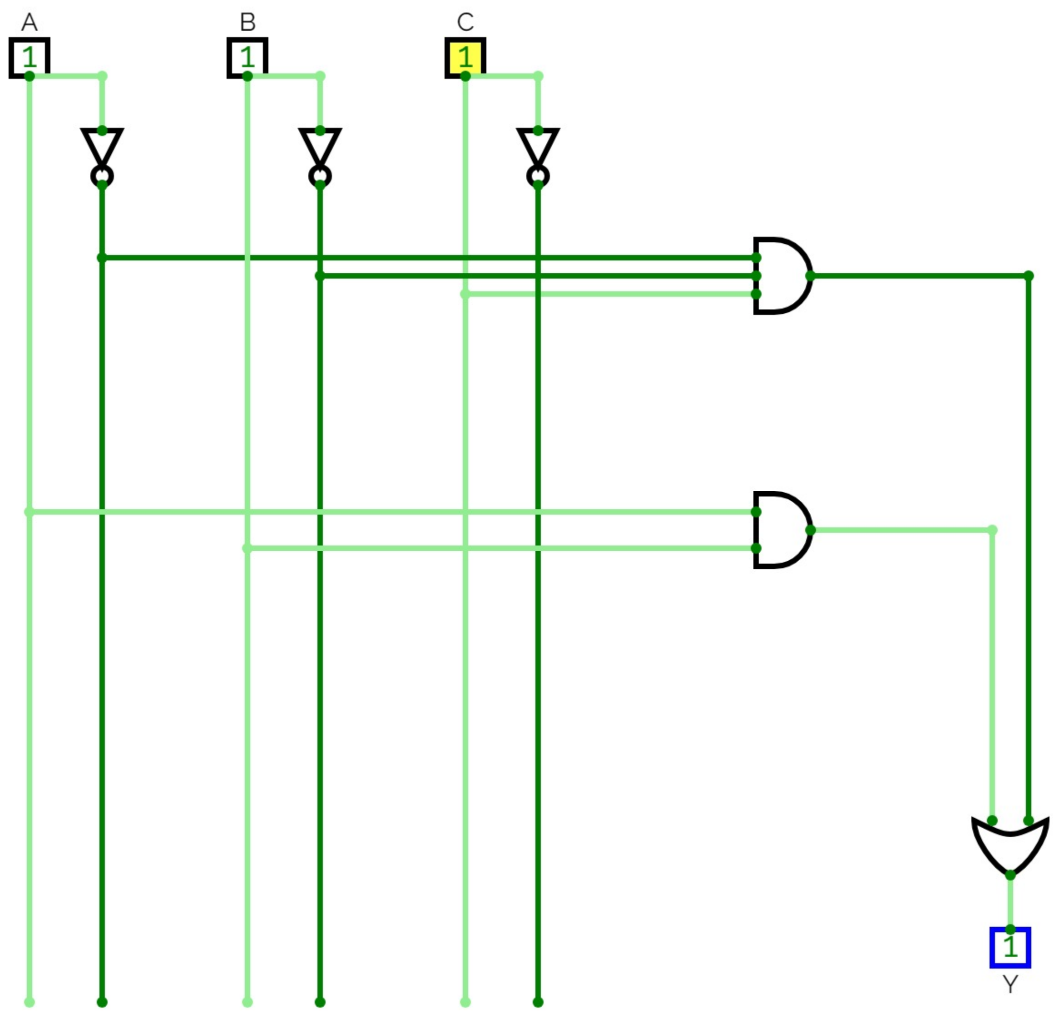
```
Group the terms with common factors:
Y = A’.B’.C + A.B.(C’ + C)

Identity law:
Y = A’.B’.C + A.B.(1)

Simplify:
Y = A’.B’.C + A.B
```

Minimized Boolean Schematic Diagram

C minimized HW 1 - Digital Logic.cv



Cost

- Original = 17
- Minimized Boolean Algebra = 11