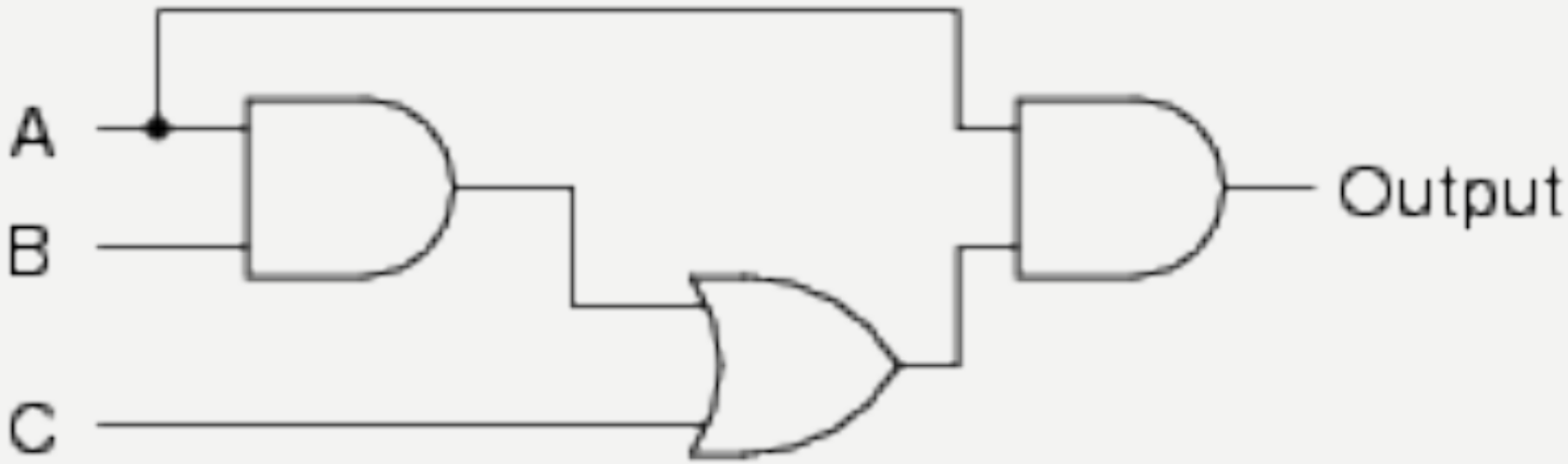
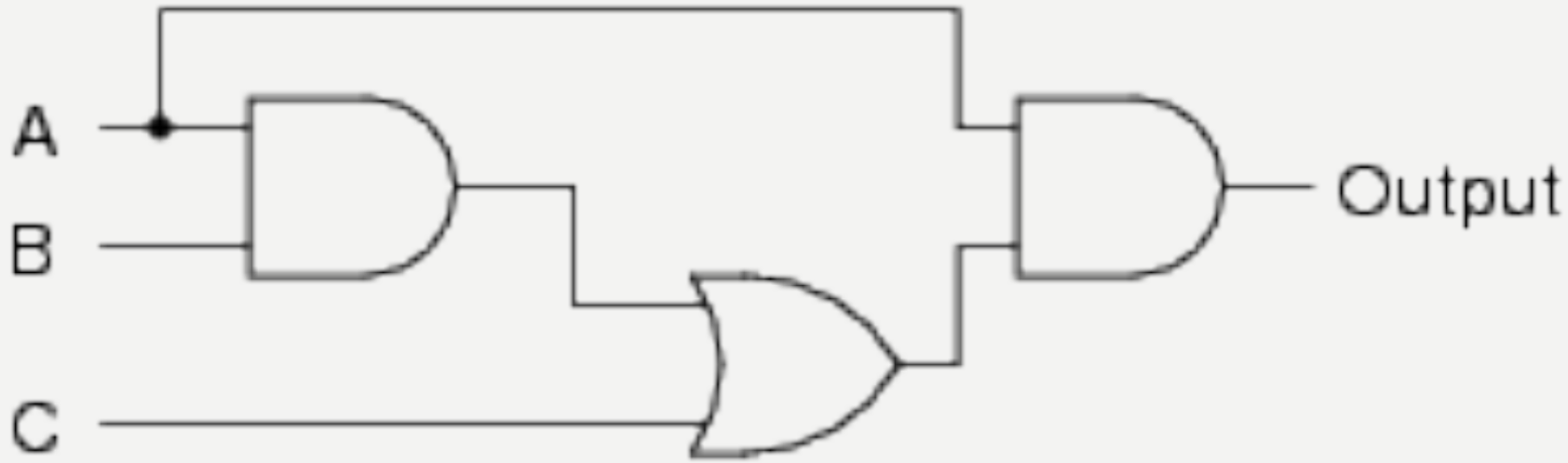
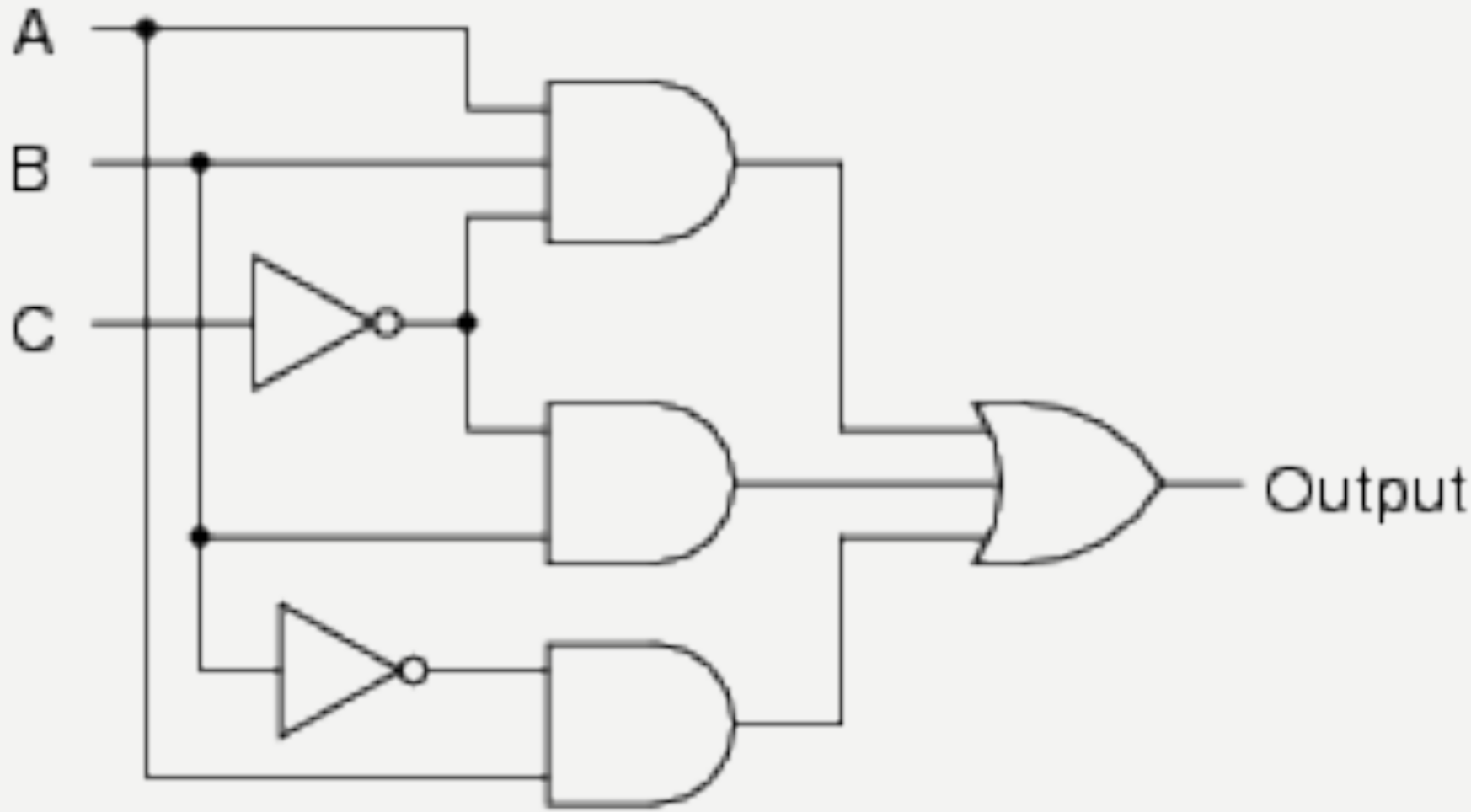
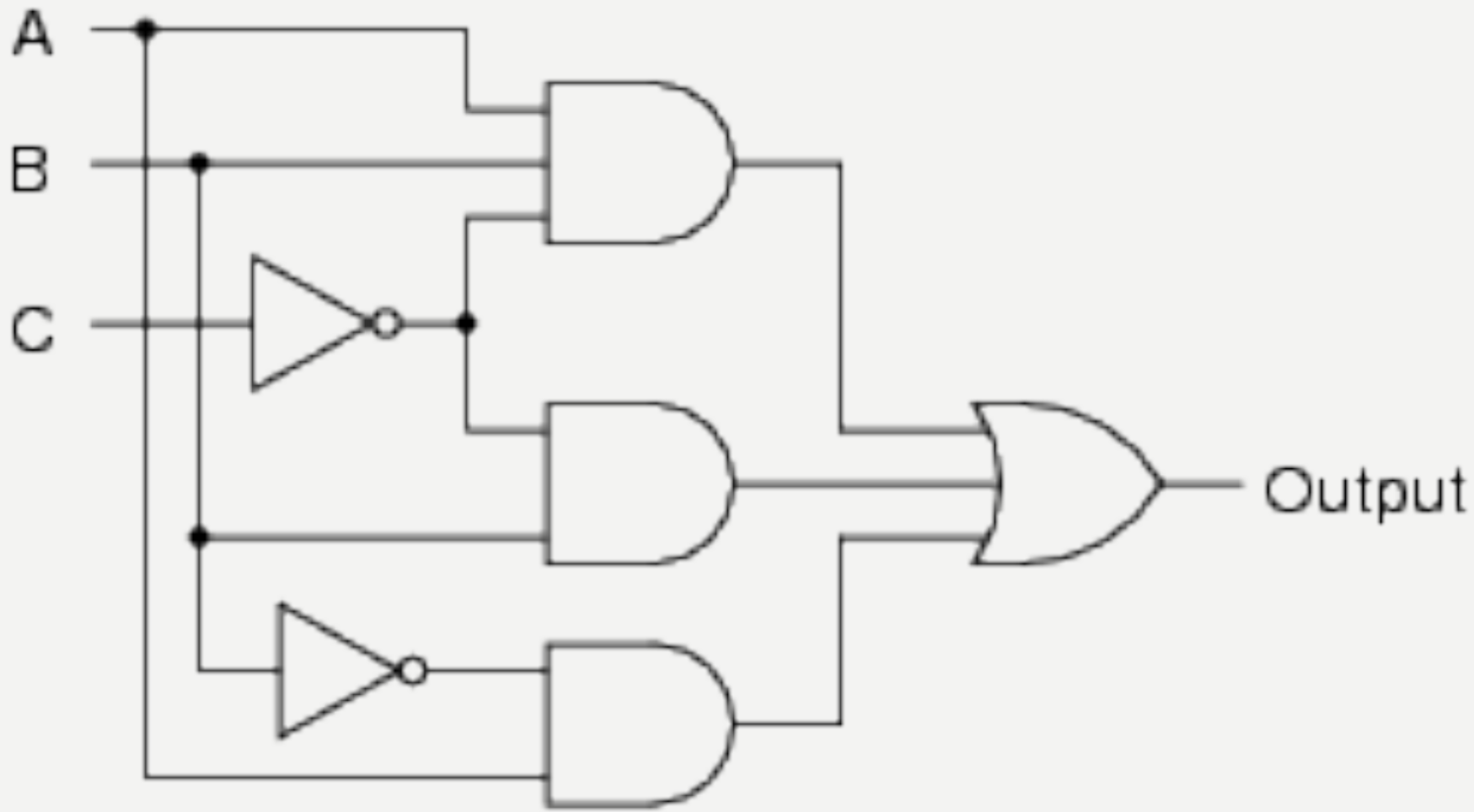

A
B
C
Output

((A*B)+C)*A

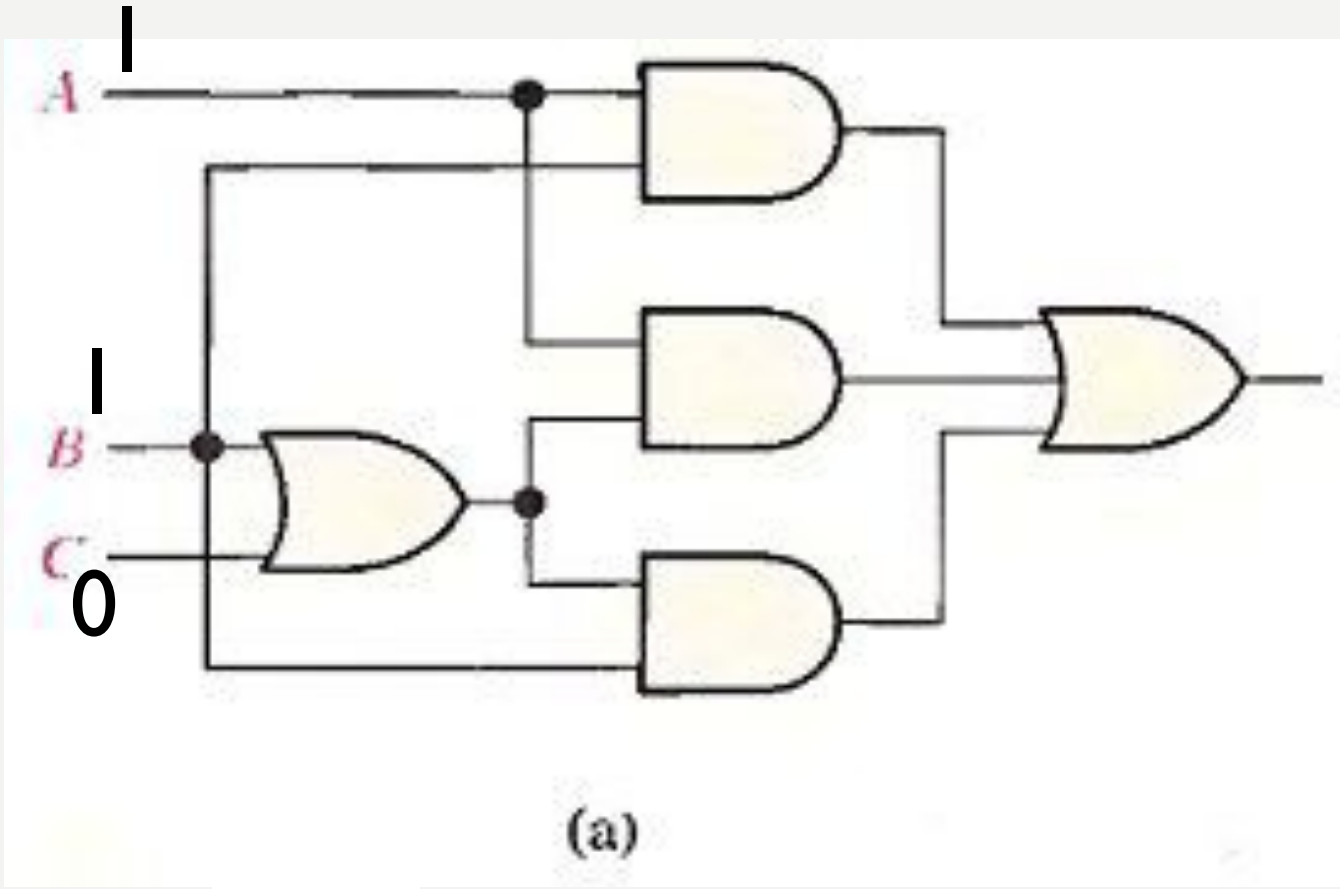


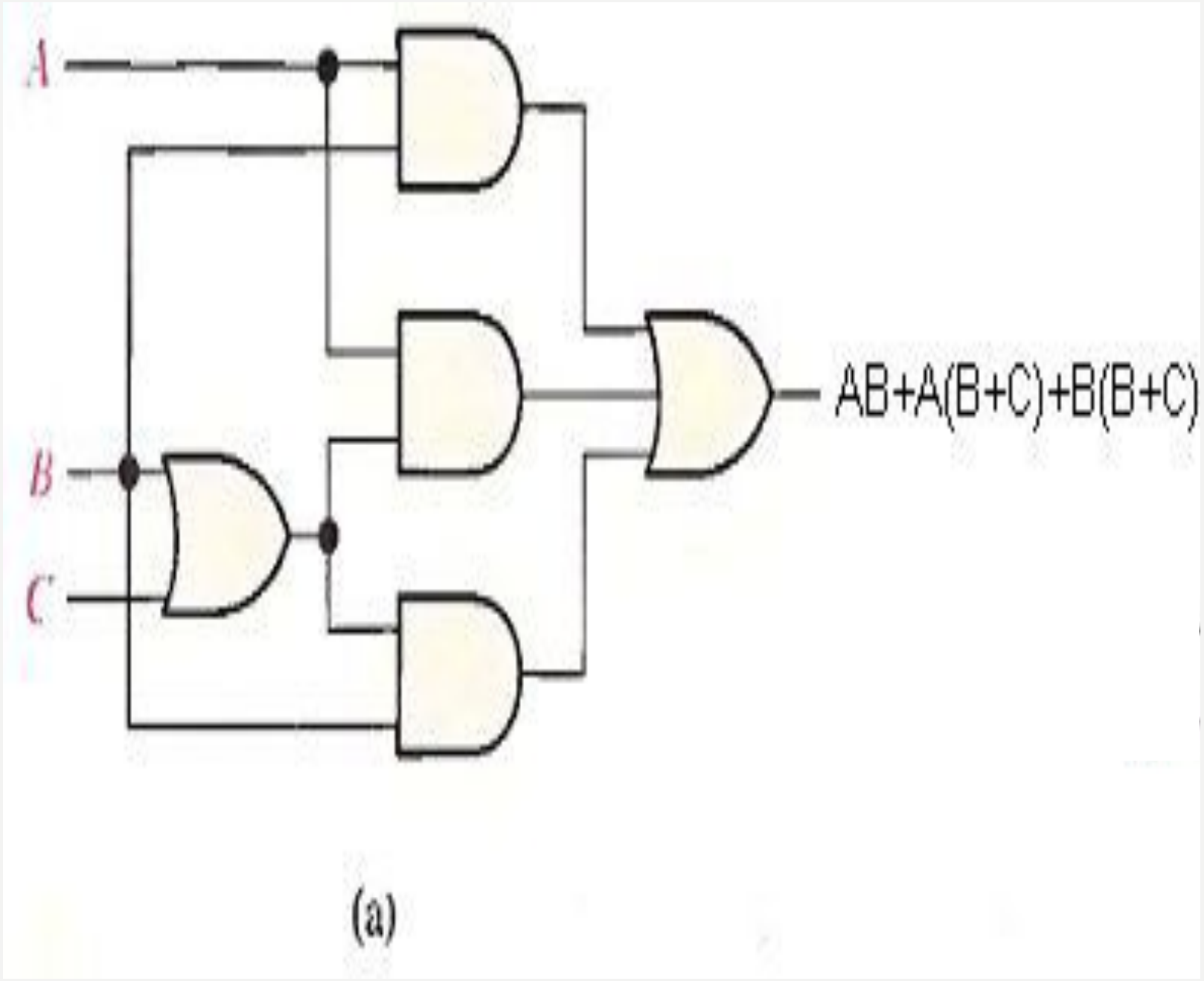

A
B
C
Output

(A*B) + (C'*B) + (A*B')



LOGIC DIAGRAM





(a)

PROBLEM 1

- A system used 3 switches A,B and C; a combination of switches determines whether an alarm, X, sounds:
- If switch A or Switch B are in the ON position and if switch C is in the OFF position then a signal to sound an alarm, X is produced.

Convert this problem into a logic statement.

1) solve logistics problems at an elementary level

2) SIMPLIFY A LOGIC CIRCUIT/EXPRESSION USING BOOLEAN ALGEBRA

Table 4-1 Basic rules of Boolean algebra.

1. $A + 0 = A$	**7.** $A \cdot A = A$
2. $A + 1 = 1$	**8.** $A \cdot \overline{A} = 0$
3. $A \cdot 0 = 0$	**9.** $\overline{\overline{A}} = A$
4. $A \cdot 1 = A$	**10.** $A + AB = A$
5. $A + A = A$	**11.** $A + \overline{A}B = A + B$
6. $A + \overline{A} = 1$	**12.** $(A + B)(A + C) = A + BC$

A, B, or C can represent a single variable or a combination of variables.

COMMUTATIVE LAWS

- $A+B = B+A$

ASSOCIATIVE LAWS :

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

DISTRIBUTIVE LAW:

- $A(B + C) = AB + AC$

DEMORGAN'S THEOREMS

- $\overline{X} + \overline{Y} = \overline{XY}$

EXAMPLE

Apply DeMorgan's theorems to the expressions $\overline{XYZ}$ and $\overline{X + Y + z}$.

$$\overline{XYZ} = \overline{X} + \overline{Y} + \overline{Z}$$

$$\overline{X + y + Z} = \overline{X}\,\overline{Y}\,\overline{Z}$$

Example

Apply DeMorgan's theorems to the expressions $\overline{WXYZ}$ and $\overline{W + X + y + z}$.

$$WXYZ = \overline{W} + \overline{X} + \overline{y} + \overline{Z}$$

$$\overline{W + X + y + Z} = \overline{W}\,\overline{X}\,\overline{Y}\,\overline{Z}$$

- Using Boolean algebra techniques, simplify this expression:
- AB + A(B + C) + B(B + C)

- $X = A.B.C + A'.C$
- $Y = (Q + R)(Q' + R')$
- $W = A.B.C + A.B'.C + A'$

- $X = A.B.C + A'.C$
- $Y = (Q + R)(Q' + R')$
- $W = A.B.C + A.B'.C + A'$

- $Y = (Q + R)(Q' + R')$
- Answer :
- $= Q.Q' + Q.R' + Q'.R + R.R'$
- $= Q.R' + Q'.R$

- W = A.B.C + A.B'.C + A'
- Answer :
- = A.C (B+B') +A'
- = A.C + A'