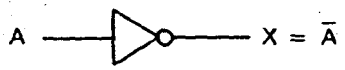
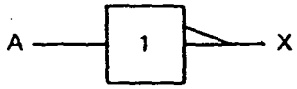
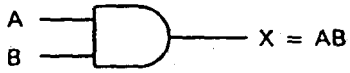
Inverter:



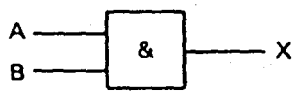
A	X
0	1
1	0



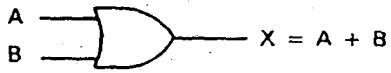
AND:



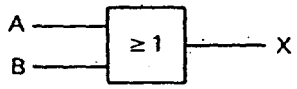
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1



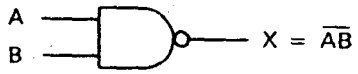
OR:



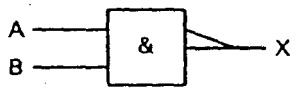
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1



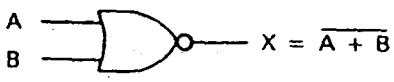
NAND:



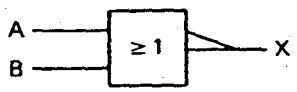
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0



NOR:



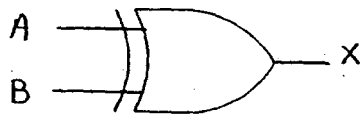
A	B	X
0	0	1
0	1	0
1	0	0
1	1	0



(a) (b) (c)

Summary of logic gates: (a) traditional logic symbols with Boolean equation; (b) truth tables; (c) IEEE/IEC standard logic symbols.

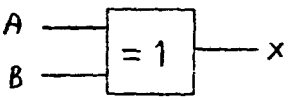
EXCLUSIVE OR:



(a)

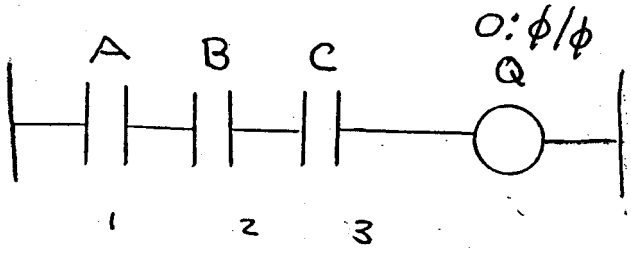
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

(b)



(c)

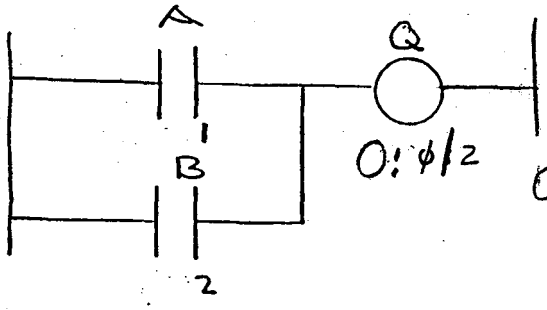
AND



A = I:ϕ/1
B = I:ϕ/2
C = I:ϕ/3

$Q = A \cdot B \cdot C$ $\quad O{:}\phi/\phi = I{:}\phi/1 \cdot I{:}\phi/2 \cdot I{:}\phi/3$

OR

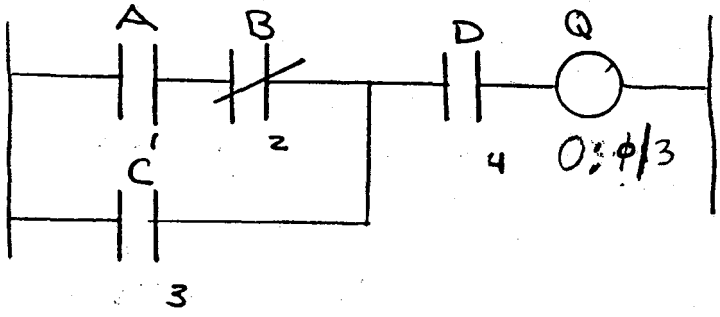


$Q = A + B$

$O{:}\phi/2 = I{:}\phi/1 + I{:}\phi/2$

COMPLEX EXPRESSION

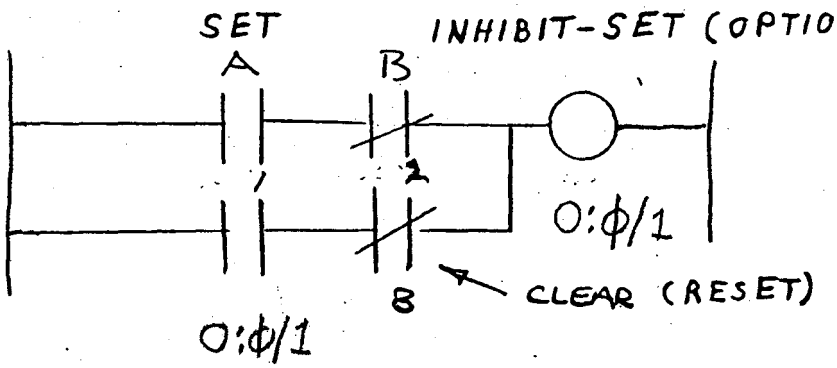
D = I:ϕ4



$Q = [(A \cdot \bar{B}) + C] \cdot D$

$O13 = ((I{:}\phi/1 \cdot \overline{I{:}\phi/2}) + I{:}\phi/3) \cdot I{:}\phi/4$

CATCH #1

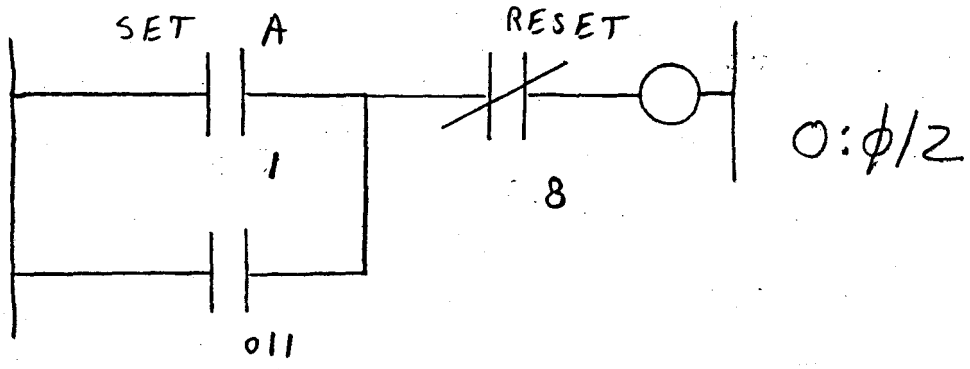


$$Q = [[A+B] \cdot C + D] \cdot E$$

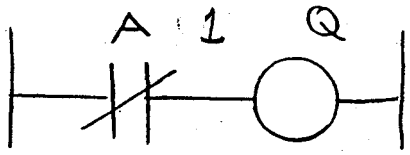
A = I:ϕ/1
B = I:ϕ/2
C = I:ϕ/3
D = I:ϕ/4

IMPLEMENT THE ABOVE EXPRESSION

LATCH #2

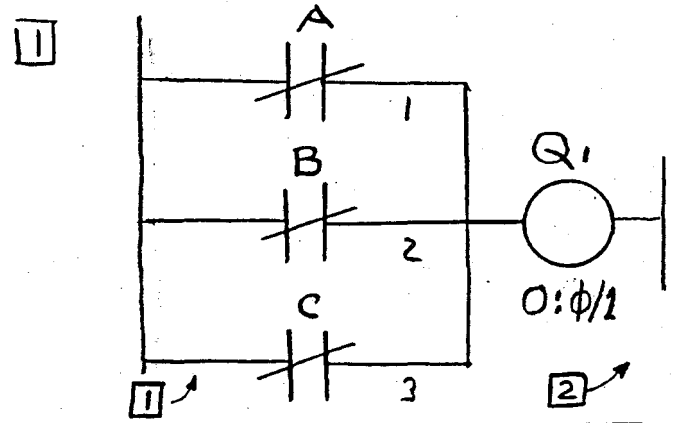


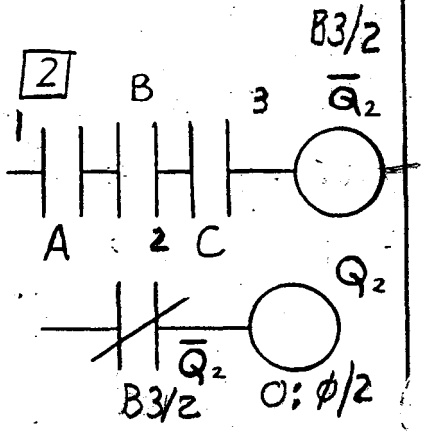
NOT



$Q = \overline{A}$ $\qquad Q = O:\phi/2 = \overline{I:\phi/1}$

NAND



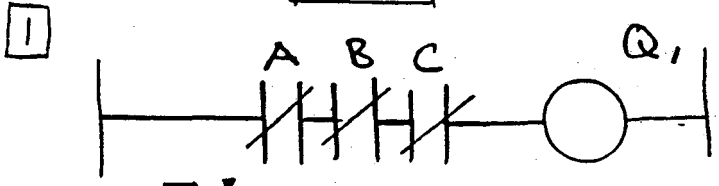


$Q_1 = \overline{A}+\overline{B}+\overline{C} = \overline{A \cdot B \cdot C} = Q_2$

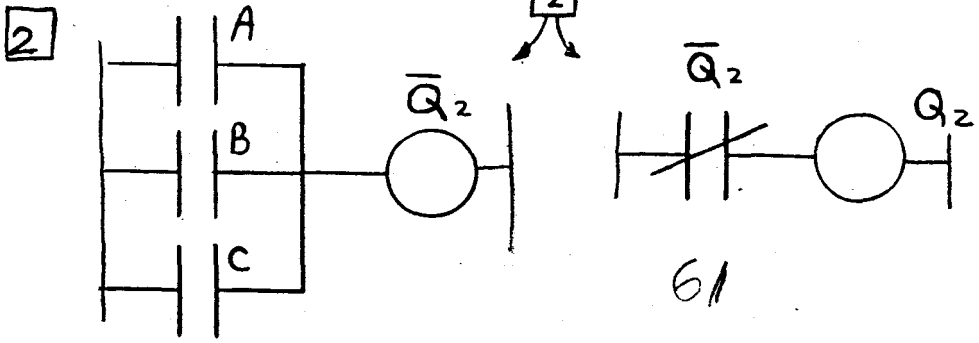
$B3/2 = I:\phi/1 \cdot I:\phi/2 \cdot I:\phi/3$

$O:\phi/2 = \overline{B3/2}$

NOR

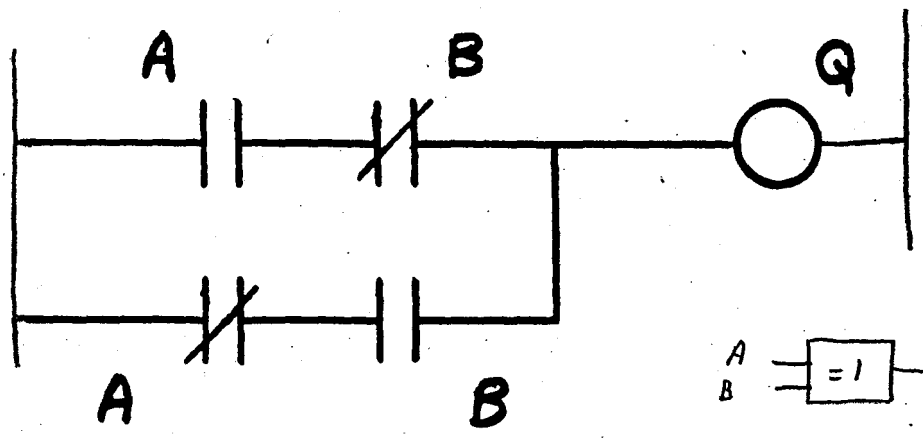


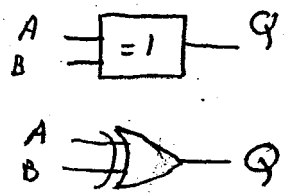
$Q_1 = \overline{A \cdot B \cdot C} = \overline{A+B+C} = Q_2$



XOR

EXCLUSIVE "OR"



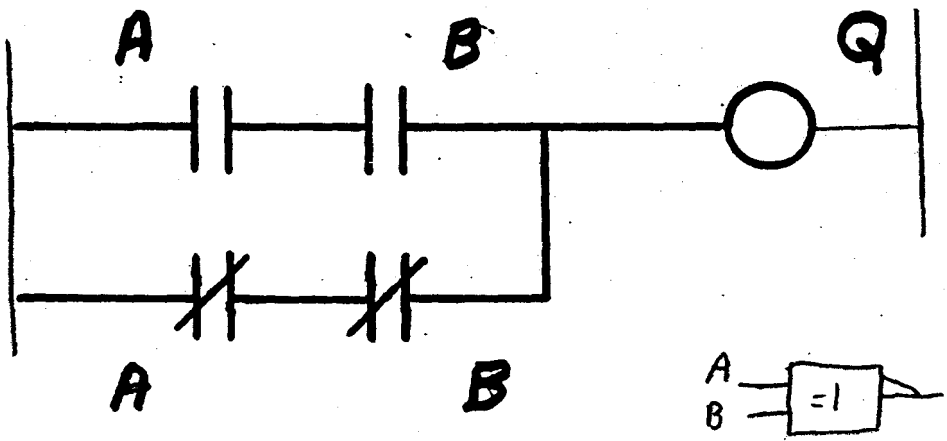


$$Q = A \cdot \bar{B} + \bar{A} B = A \oplus B$$

$$= \overline{A \odot B}$$

XNOR

EXCLUSIVE "NOR"



$$Q = A \cdot B + \bar{A} \cdot \bar{B} = \overline{A \oplus B}$$

$$= A \odot B$$