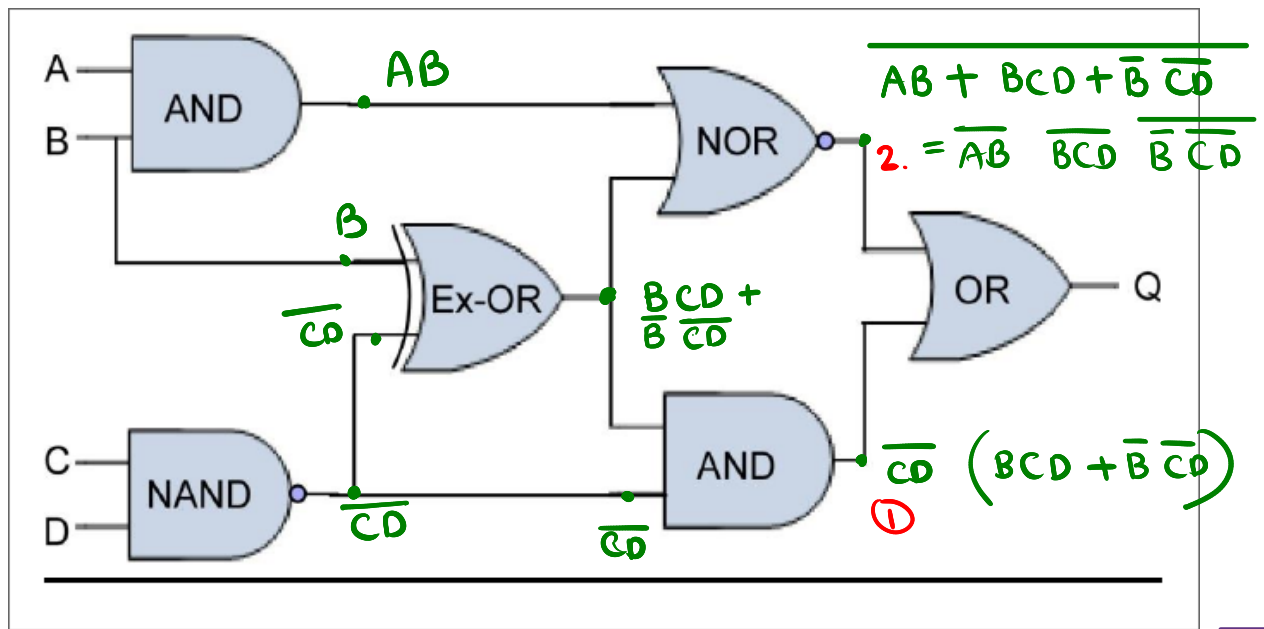


$$\begin{aligned}
 & \bullet \quad B(C+D) + \bar{B}(\overline{C+D}) + \overline{C+D} \\
 & = (\overline{C+D} + B) + \bar{B}(\overline{C+D}) \\
 & = \overline{C+D} + B = (B + \overline{C+D}) = B + \overline{C+D}
 \end{aligned}$$

$$\begin{aligned}
 Q & = (B + \overline{C+D}) \bar{A}B(C+D) \\
 & = \bar{A}B(B(C+D)) \\
 & \boxed{Q = \bar{A}B(C+D)}
 \end{aligned}$$

A	B	C	D	Output
0	0	0	0	F
0	0	0	1	F
0	0	1	0	F
0	0	1	1	F
0	1	0	0	F
0	1	0	1	T
0	1	1	0	T
0	1	1	1	T
1	0	0	0	F
1	0	0	1	F
1	0	1	0	F
1	0	1	1	F
1	1	0	0	F
1	1	0	1	F
1	1	1	0	F
1	1	1	1	F



$$\begin{aligned} \textcircled{1} &\Rightarrow BCD \overline{CD} + \overline{B} \overline{CD} \\ &= \overline{CD} (BCD + \overline{B}) \\ &= \overline{CD} (\overline{B} + CD) \\ &= \overline{B} \overline{CD} \end{aligned} \quad \bigg| \quad \textcircled{2} \quad \overline{AB} \times \overline{BCD} \times \overline{\overline{B} \overline{CD}}$$

$$Q = \overline{B} \overline{CD} + \overline{AB} \overline{BCD} \overline{\overline{B} \overline{CD}}$$

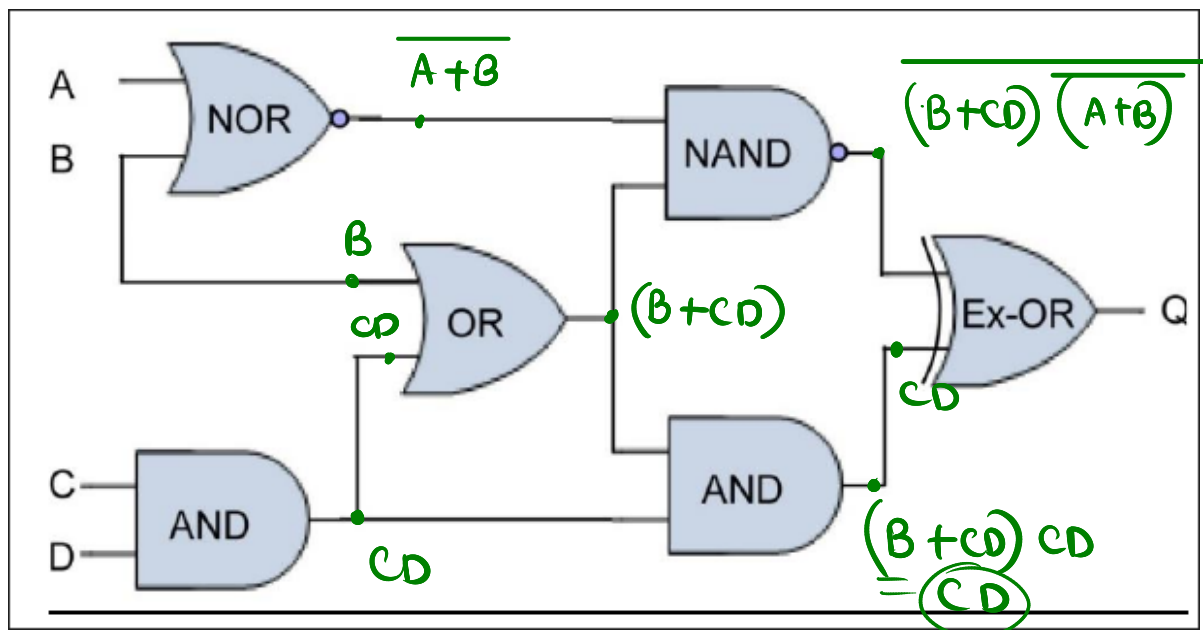
$$= (\overline{B} \overline{CD} + \overline{AB} \overline{BCD})$$

$$= \overline{B} \overline{CD} + \overline{A} \overline{BCD} + \overline{B} \overline{BCD}$$

$$= \overline{B} (\overline{CD} + \overline{B}) + \overline{A} \overline{B} + \overline{A} \overline{CD}$$

$$= \overline{CD} (\overline{A} + \overline{B}) + \overline{B} = \overline{A}(\overline{C} + \overline{D}) + \overline{B} = (\overline{A}\overline{C} + \overline{A}\overline{D} + \overline{B})$$

A	B	C	D	Output
0	0	0	0	T
0	0	0	1	T
0	0	1	0	T
0	0	1	1	T
0	1	0	0	T
0	1	0	1	T
0	1	1	0	T
0	1	1	1	F
1	0	0	0	T
1	0	0	1	T
1	0	1	0	T
1	0	1	1	T
1	1	0	0	F
1	1	0	1	F
1	1	1	0	F
1	1	1	1	F



$$Q = (CD)(B+CD)(\overline{A+B}) + (B+CD)(\overline{A+B})\overline{CD}$$

$$= \overline{A}\overline{B}CD + (\overline{B}\overline{CD} + (A+B))\overline{CD}$$

$$= (\overline{A}\overline{B}CD + \overline{C} + \overline{D}) \overline{B}\overline{CD} + (A+B)\overline{CD}$$

$$= (\overline{A}\overline{B}D + \overline{C}) + \overline{D}$$

$$= (\overline{A}\overline{B} + \overline{D}) + \overline{C}$$

$$Q = \overline{A}\overline{B} + \overline{C} + \overline{D}$$

A	B	C	D	Output
0	0	0	0	T
0	0	0	1	T
0	0	1	0	T
0	0	1	1	T
0	1	0	0	T
0	1	0	1	T
0	1	1	0	T
0	1	1	1	F
1	0	0	0	T
1	0	0	1	T
1	0	1	0	T
1	0	1	1	F
1	1	0	0	T
1	1	0	1	T
1	1	1	0	T
1	1	1	1	F