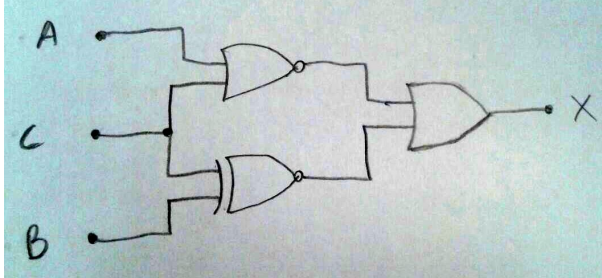


01

$$X = \overline{ABC} + \overline{AB}C + \overline{A}BC + \overline{A}B\overline{C} + ABC = \overline{BC}(\overline{A} + A) + BC(\overline{A} + A) + \overline{A}B\overline{C} = \overline{BC} + BC + \overline{A}B\overline{C} = \overline{C}(\overline{B} + \overline{A}B) + BC = \overline{C}(\overline{B} + \overline{A}) + BC = \overline{AC} + \overline{BC} + BC = \overline{A} + \overline{C} + B \oplus C$$

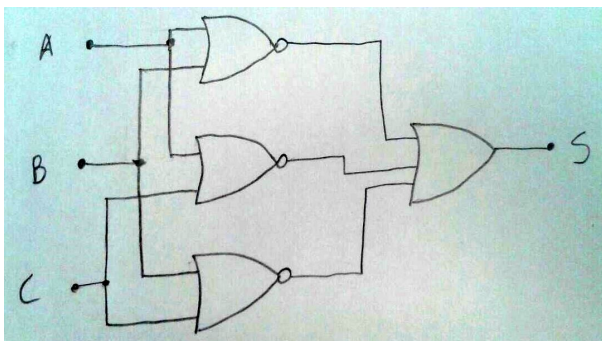


02

A	B	C	S
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0

A	B	C	S
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

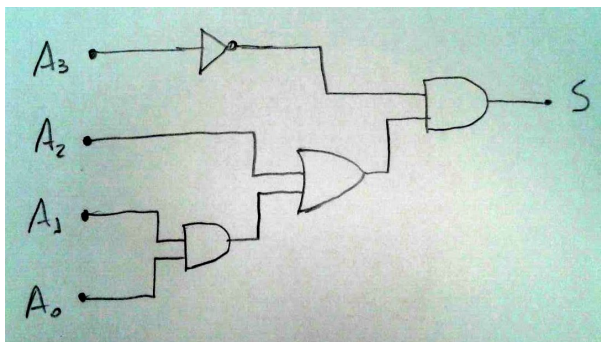
$$S = \overline{ABC} + \overline{AB}C + \overline{A}BC + \overline{A}B\overline{C} = \overline{AB}(\overline{C} + C) + \overline{A}B\overline{C} + \overline{A}B\overline{C} = \overline{AB} + \overline{A}B\overline{C} + \overline{A}B\overline{C} = \overline{A}(\overline{B} + \overline{B}C) + \overline{A}B\overline{C} = \overline{A}(\overline{B} + \overline{A}C) + \overline{A}B\overline{C} = \overline{A}\overline{B} + \overline{A}C + \overline{A}B\overline{C} = \overline{A}\overline{B} + \overline{A}C + \overline{A}B\overline{C}$$



03

A ₃	A ₂	A ₁	A ₀	S
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

$$\begin{aligned} \overline{A_3}A_2A_1A_0 + \overline{A_3}A_2\overline{A_1}A_0 + \overline{A_3}A_2A_1\overline{A_0} + \overline{A_3}A_2A_1A_0 + \overline{A_3}A_2A_1A_0 &= \overline{A_3}A_1A_0(\overline{A_2} + A_2) + \overline{A_3}A_2\overline{A_0}(\overline{A_1} + A_1) + \overline{A_3}A_2A_1A_0 \\ &= \overline{A_3}A_1A_0 + \overline{A_3}A_2\overline{A_0} + \overline{A_3}A_2A_1A_0\overline{A_3}A_1A_0 + \overline{A_3}A_2(\overline{A_0} + A_1A_0) = \overline{A_3}A_1A_0 + \overline{A_3}A_2\overline{A_0} + \overline{A_3}A_2A_1 \\ &= \overline{A_3}(A_1A_0 + A_2\overline{A_0} + A_2A_1) = \overline{A_3}[A_2(\overline{A_1} + A_0) + A_1A_0] = \overline{A_3}(A_2A_1A_0 + A_1A_0) = \overline{A_3}(A_1A_0 + A_2) \end{aligned}$$



04

P	I	L	A
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$$A = \overline{P}IL + P\overline{I}L + P\overline{I}L + P\overline{I}L = \overline{I}L(\overline{P} + P) + P\overline{I}(L + L) = \overline{I}L + P\overline{I}$$

