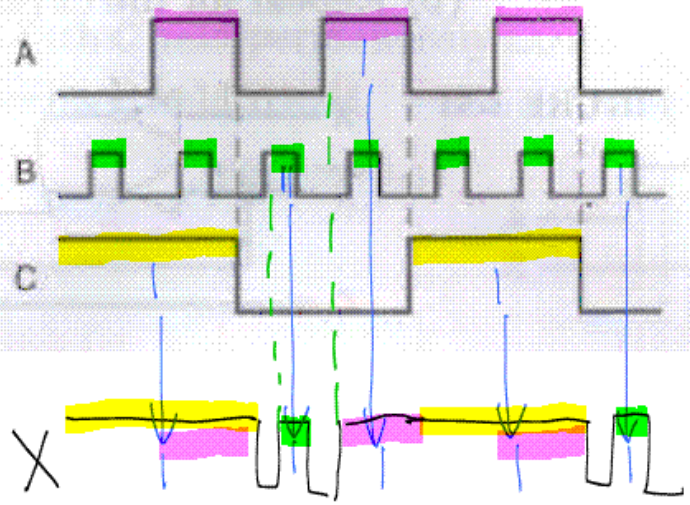
→3-1. Draw the output waveform for the OR gate of Figure 3-52.

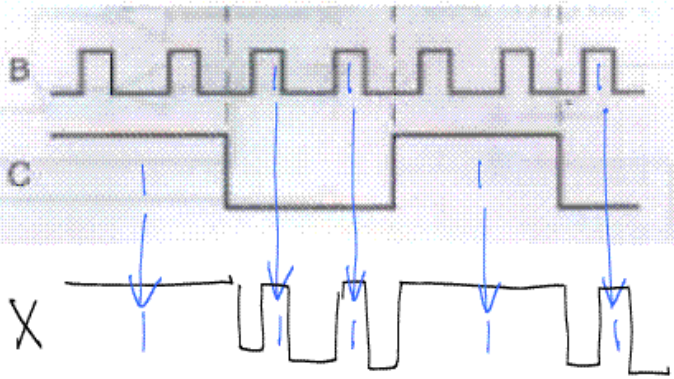
FIGURE 3-52

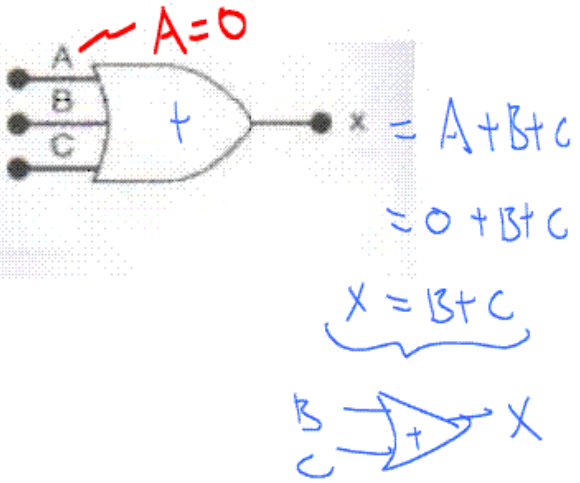


X = 1 when any i/p = 1

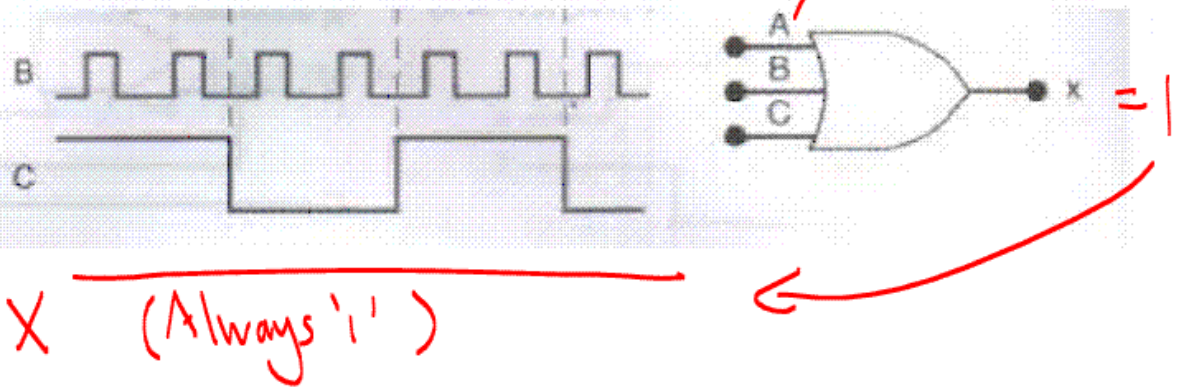
Must show both the inputs & output waveform, because the relative timing between them is important.

3-2. Suppose that the *A* input in Figure 3-52 is unintentionally shorted to ground (i.e., $A = 0$). Draw the resulting output waveform.

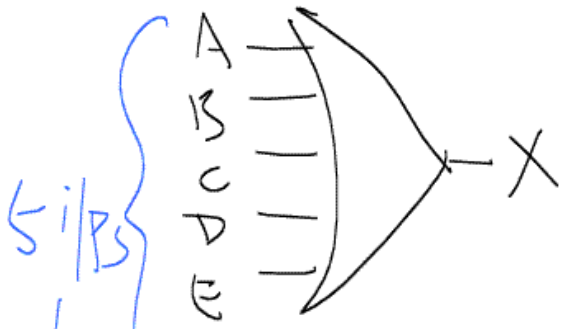




→ 3-3. Suppose that the *A* input in Figure 3-52 is unintentionally shorted to the +5 V supply line (i.e., *A* = 1). Draw the resulting output waveform.



→ 3-5. How many different sets of input conditions will produce a HIGH output from a five-input OR gate?



5 i/ps

$2^5 = 32$ combinations

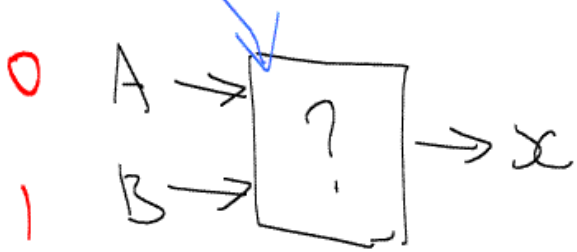
A	B	C	D	E	X
0	0	0	0	0	0
0	0	0	0	1	1
1	1	1	1	1	1

o/p = 1

Ans

31 (out of 32) input combinations will produce a '1' output.

3-9. Suppose that you have an unknown two-input gate that is either an OR gate or an AND gate. What combination of input levels should you apply to the gate's inputs to determine which type of gate it is?



OR gate

A	B	x
0	0	0
0	1	1
1	0	1
1	1	1

AND gate

A	B	x
0	0	0
0	1	0
1	0	0
1	1	1

Ans.

Apply '0' and '1' to A and B,

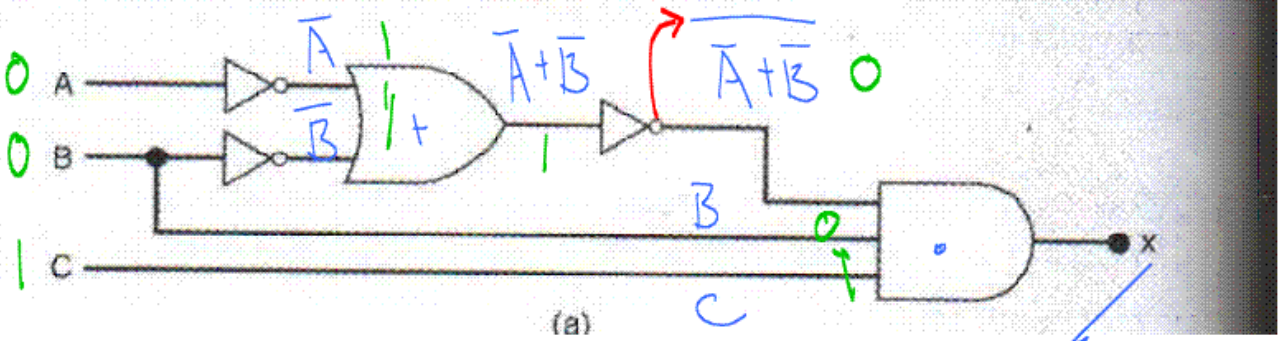
if $x = 1 \Rightarrow$ OR gate,

if $x = 0 \Rightarrow$ AND ".

B →3-12. (a) Write the Boolean expression for output x in Figure 3-53(a). Determine the value of x for all possible input conditions, and list the values in a truth table.

(b) Repeat for the circuit in Figure 3-53(b).

FIGURE 3-53



A	B	C	x
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Ans: $x = \overline{\overline{A}+\overline{B}} \cdot B \cdot C$

$\overline{\overline{A}+\overline{B}} \neq A+B$

$= \overline{\overline{A}} \cdot \overline{\overline{B}}$ (DMT)

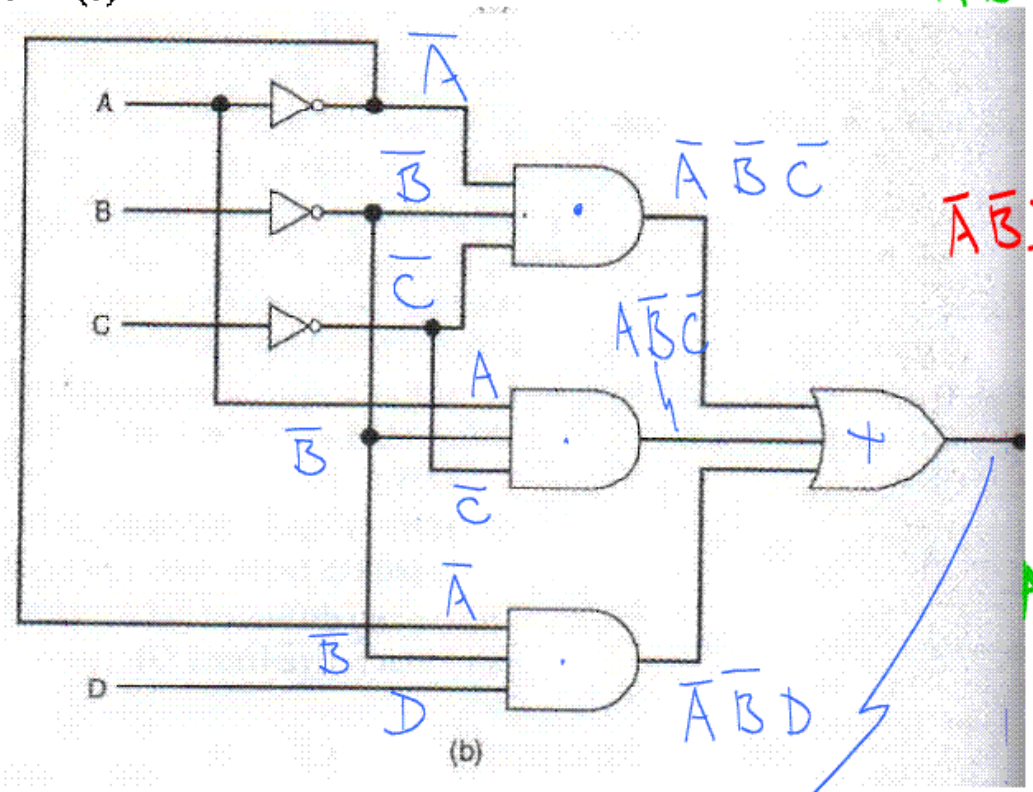
$= A \cdot B$

Not required in this question

$= A \cdot B \cdot B \cdot C$

$= A \cdot B \cdot C$

3-12 (b)



Ans. $X = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}D$

Simplification Not required

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

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