Bogg 12.13.2 Truth tables:

$X = \bar{A} + B$

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

$Y = \bar{A} \cdot B \cdot C$

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

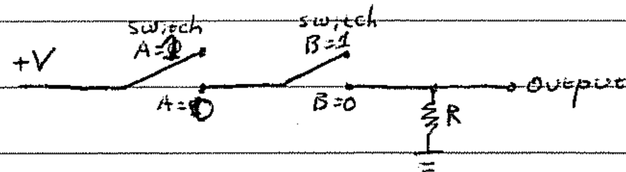
$Z = A \oplus B + \bar{C}$

A	B	C	Z
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

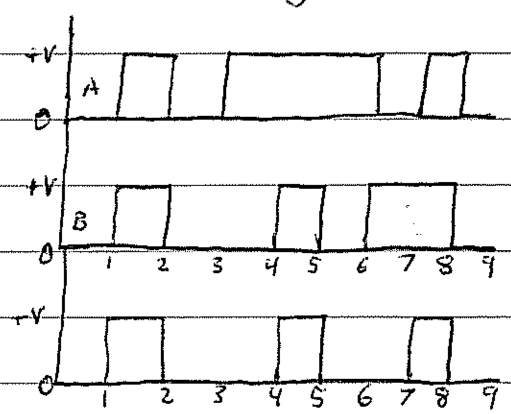
A	B	$\bar{A}$	$\bar{B}$	$\overline{A+B} \equiv$ NOR of A and B		$\bar{A} \cdot \bar{B}$
0	0	1	1	1	=	1
0	1	1	0	0	=	0
1	0	0	1	0	=	0
1	1	0	0	0	=	0

12.13.4 When A is +V volts and B is +V volts, i.e. when both A and B are logic 0 (this logic system is the reverse of the more common 0 = 0 volts, 1 = +V volts, but that is OK, occasionally one will encounter reversed logic systems) then current flows freely between the collector and emitter of the two transistors, and thus the output will be at +V volts, i.e. logic 0 as well. When either or both of A or B is at 0 volts, i.e. when A or B is logic 1, then current cannot flow between the collector and emitter of that transistor

12.13.4 (cont'd) and thus the output voltage will be pulled down to 0 volts by the pull-down resistor R, and thus the output will be logic 1. Thus if either A OR B is 1, the output is 1 as well, and thus this circuit is an OR. One could represent the logical action of this circuit using switches as the following:



With the pulses shown in Fig. 12.27(b):

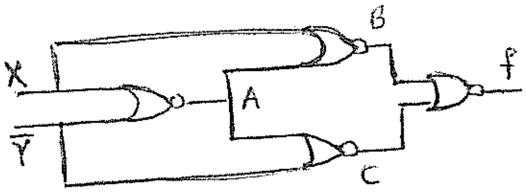


, we would have the following output:

If +V volts becomes the 1 state and 0 volts the 0 state, the OR becomes an AND, as shown in the following truth table:

A voltage	B voltage	output voltage	old logic system A	old logic system B	old logic system output	new logic system A	new logic system B	new logic system output
0	0	0	1	1	1	0	0	0
0	+V	0	1	0	1	0	1	0
+V	0	0	0	1	1	1	0	0
+V	+V	+V	0	0	0	1	1	1

12.13.5



X	$\overline{Y}$	A	B	C	f
0	1	0	1	0	0
0	0	1	0	0	1
1	1	0	0	0	1
1	0	0	0	1	0

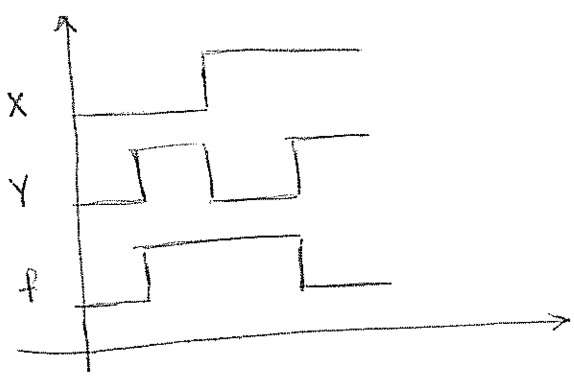
$\Rightarrow$ "XOR" logic function

$$f = \overline{B+C} = \overline{B}\cdot\overline{C} = (X+A)\cdot(\overline{Y}+A) = (X+(\overline{X+\overline{Y}}))\cdot(\overline{Y}+(\overline{X+\overline{Y}})) = (X+(\overline{X}\cdot Y))\cdot(\overline{Y}+(\overline{X}\cdot Y))$$

$$= [(X+\overline{X})\cdot(X+Y)]\cdot[(\overline{Y}+\overline{X})\cdot(\overline{Y}+Y)] = (X+Y)\cdot(\overline{Y}+\overline{X}) = [((\overline{Y}+\overline{X})\cdot X)+((\overline{Y}+\overline{X})\cdot Y)] =$$

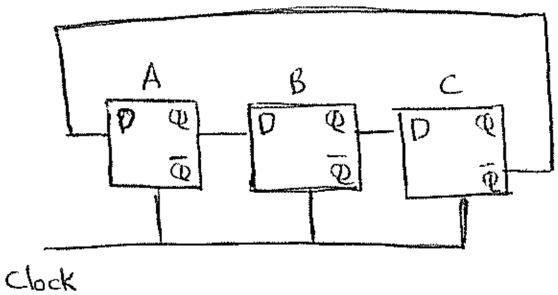
$$= (X\cdot\overline{Y}+X\cdot\overline{X})+(Y\cdot\overline{Y}+\overline{X}\cdot Y) = (X\cdot\overline{Y})+(\overline{X}\cdot Y) = \boxed{X\cdot\overline{Y}+\overline{X}\cdot Y}$$

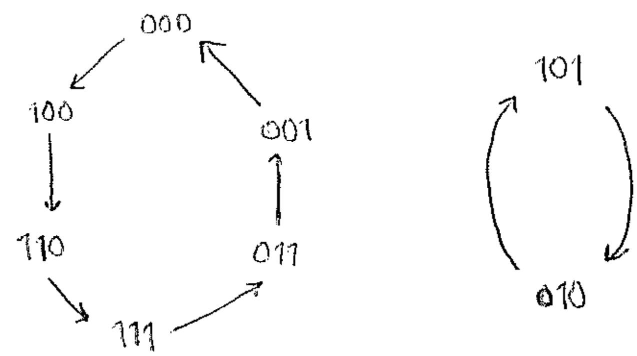
X	Y	f
0	0	0
0	1	1
1	0	1
1	1	0



13_9.2

ABC = 000 , 100 , 110 , 111 , 011 , 001 , 000





13.9.6