2-30

$$x \oplus y = x\bar{y} + \bar{x}y$$

Dual of $x \oplus y = (\bar{x} + y)(x + \bar{y})$

Compliment of $x \oplus y = \overline{(x\bar{y} + \bar{x}y)} = (x + \bar{y})(\bar{x} + y)$

Hence, both are the same.

2-31

Disjunction Theorem: if $f = a \oplus b$ & $ab = 0$

then $f = a + b$

Proof: $f = a \oplus b = \bar{a}b + a\bar{b}$

$= \bar{a}b + a\bar{b} + ab$ (since $ab = 0$)

$= \bar{a}b + a(b + \bar{b})$

$= \bar{a}b + a = a + b$

$$F = AB\bar{C}D + A\bar{D} + \bar{A}D$$

We can see in the above function that,

$(A\bar{D})(AB\bar{C}D) = 0$

$(A\bar{D})(\bar{A}D) = 0$

$(\bar{A}D)(AB\bar{C}D) = 0$

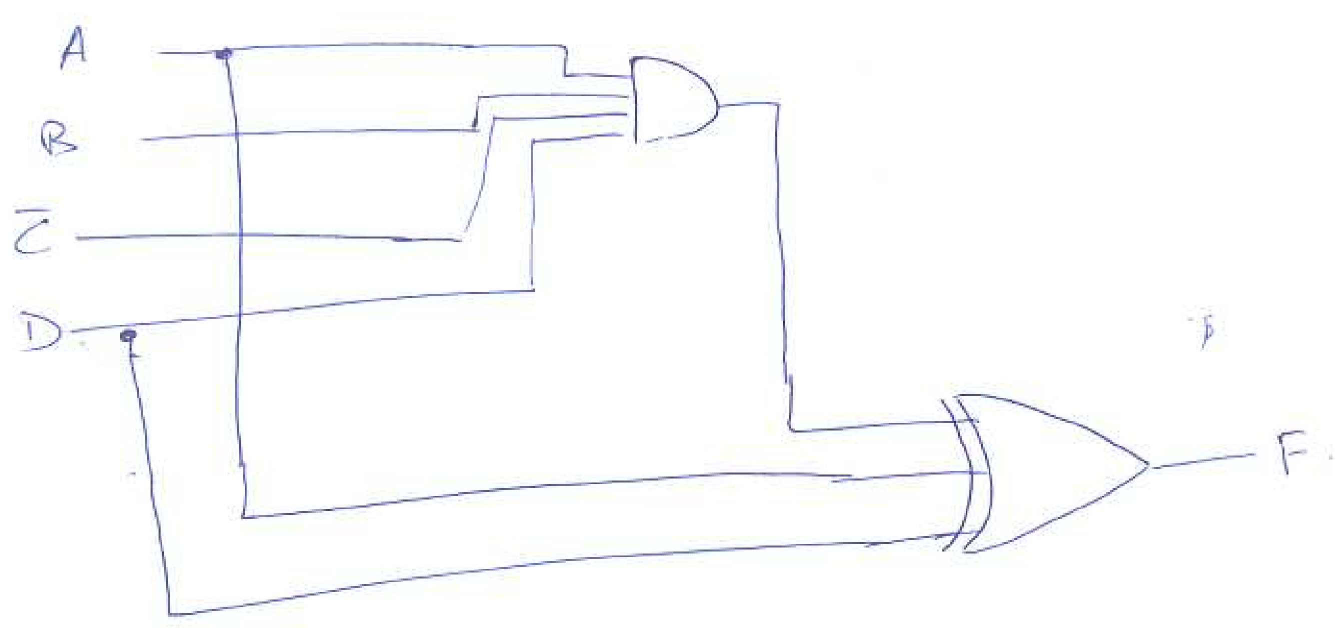
Thus, $F = AB\bar{C}D \oplus A\bar{D} \oplus \bar{A}D$

$$= AB\bar{C}D \oplus \left[(\bar{A}+D)\bar{A}D + (A+\bar{D})A\bar{D} \right]$$

$$= AB\bar{C}D \oplus \left[\bar{A}D + A\bar{D} \right]$$

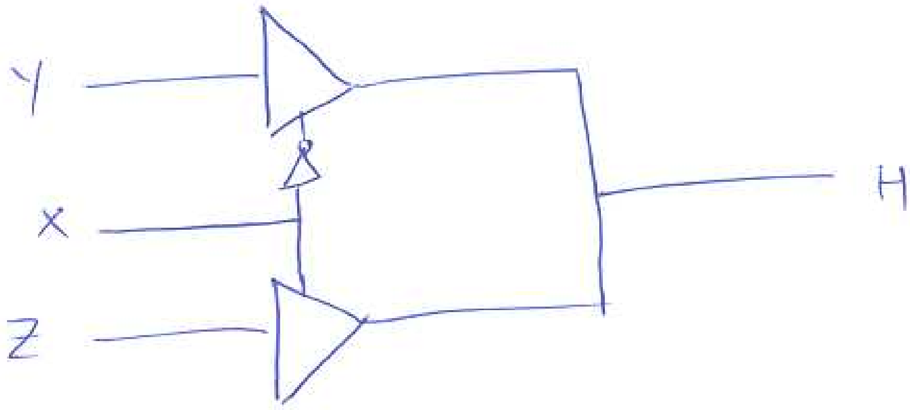
$$= AB\bar{C}D \oplus A \oplus D$$

Thus the circuit is as follows:

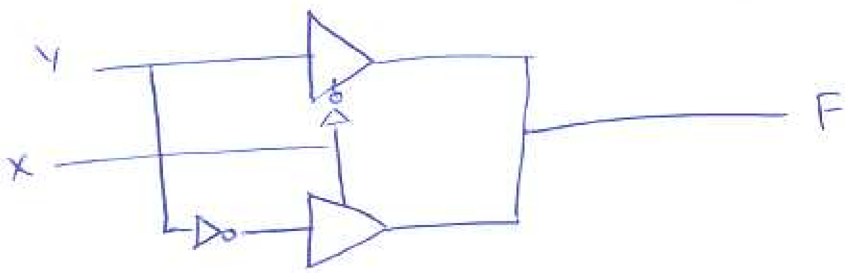


2-32.

(a) $H = \bar{X}Y + XZ$

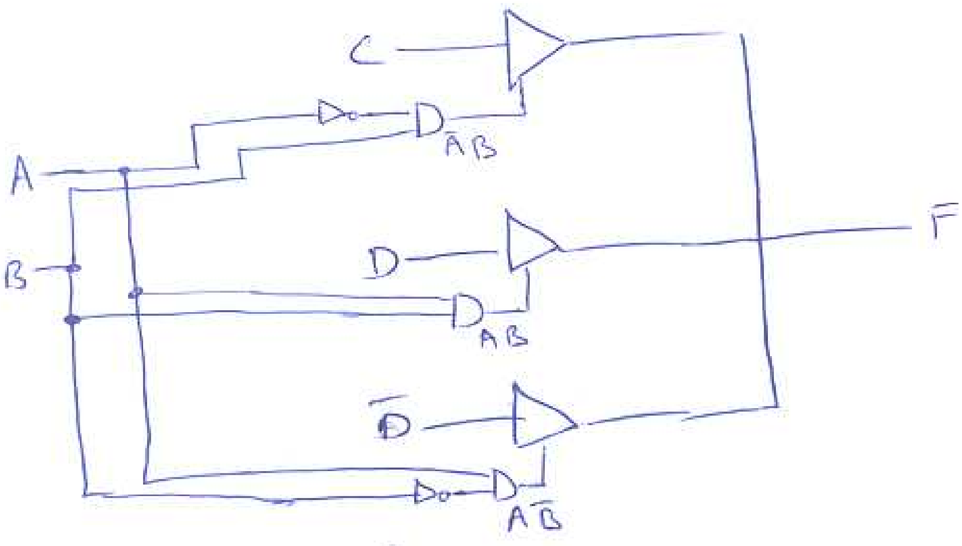


(b) $F = \bar{X}Y + X\bar{Y}$



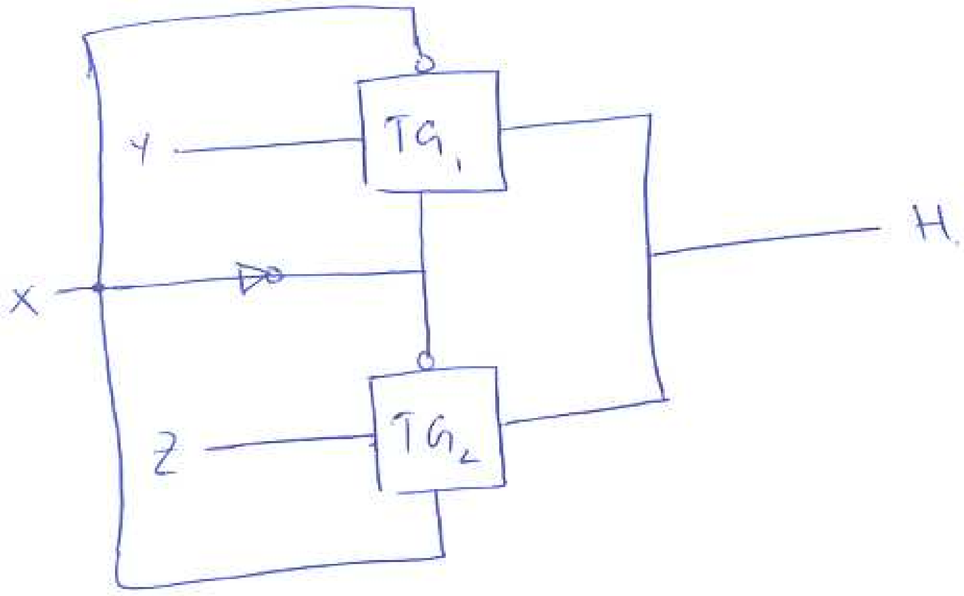
2-33

$F = \bar{A}BC + ABD + A\bar{B}\bar{D}$



2-34

$H = \bar{X} Y + X Z$



2-35

(a) The output F is High-impedance when both input A & B are 0's.

(b)

A	B	F
0	0	Hi-Z
0	1	C
1	0	$\bar{D}$
1	1	D

Since $\bar{A}\bar{B}$ is the only condition where Hi-Z exists, we can incorporate it in the enable logic so that F is never Hi-Z.

Let us assume we want F to be C when $\bar{A}\bar{B}$.

Thus, the enable logic for C will change as follows

$$\bar{A}D + \bar{A}\bar{B} = \bar{A}$$