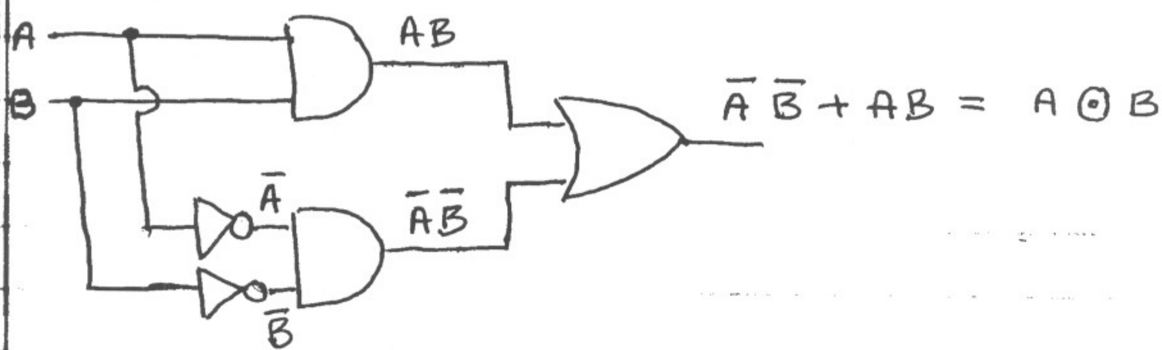
11.26

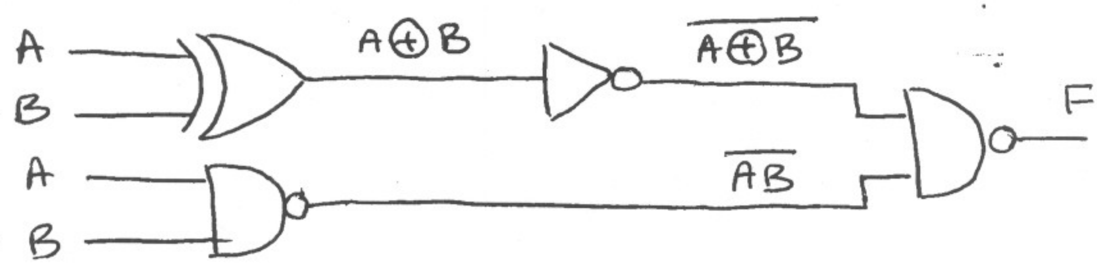
A	B	$A \odot B$
0	0	1
0	1	0
1	0	0
1	1	1

From sum of products,

$$A \odot B = \bar{A} \cdot \bar{B} + A \cdot B$$



11.29



$$F = \overline{\overline{A \oplus B} \cdot \overline{AB}} = \overline{\overline{\left(\bar{A} B + A\bar{B}\right)} \cdot \overline{AB}}$$

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

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

$$= (\bar{A} + A) B + A(\bar{B} + B) = \boxed{A + B}$$

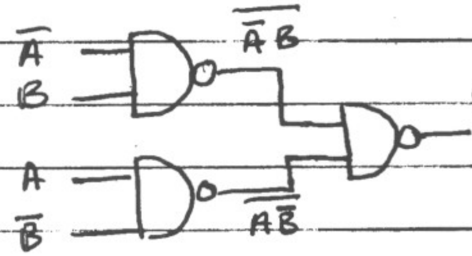
Truth table

A	B	$A \oplus B$	$\overline{A \oplus B}$	AB	$\overline{AB}$	$\overline{(A\oplus B)}\ \overline{AB}$	$F = \overline{\overline{(A\oplus B)}\ \overline{AB}}$
0	0	0	1	0	1	1	0
0	1	1	0	0	1	0	1
1	0	1	0	0	1	0	1
1	1	0	1	1	0	0	1

So the truth table verifies that $F = A + B$

This table describes the OR operation.

11.31 (a)



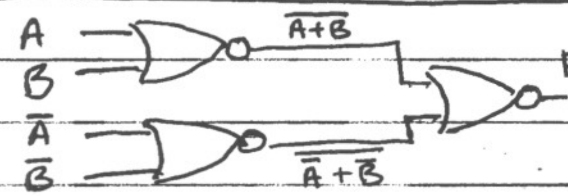
$$F = \overline{\overline{\bar{A}B} \cdot \overline{A\bar{B}}} = \bar{A}B + A\bar{B}$$

Truth table

A	B	$\bar{A}$	$\bar{B}$	$\bar{A}B$	$\overline{\bar{A}B}$	$A\bar{B}$	$\overline{A\bar{B}}$	$\overline{\bar{A}B} \cdot \overline{A\bar{B}}$	F
0	0	1	1	0	1	0	1	1	0
0	1	1	0	1	0	0	1	0	1
1	0	0	1	0	1	1	0	0	1
1	1	0	0	0	1	0	1	1	0

This table describes the exclusive-OR operation.

(b)



$$F = \overline{\overline{A+B} + \overline{\bar{A}+\bar{B}}}$$
$$= (A+B)\cdot(\bar{A}+\bar{B})$$
$$= A\bar{A} + B\bar{A} + A\bar{B} + B\bar{B}$$
$$= B\bar{A} + A\bar{B}$$

Truth table

A	B	$\bar{A}$	$\bar{B}$	$A+B$	$\overline{A+B}$	$\bar{A}+\bar{B}$	$\overline{\bar{A}+\bar{B}}$	$\overline{A+B} + \overline{\bar{A}+\bar{B}}$	F
0	0	1	1	0	1	1	0	1	0
0	1	1	0	1	0	1	0	0	1
1	0	0	1	1	0	1	0	0	1
1	1	0	0	1	0	0	1	1	0

This table describes the exclusive-OR operation.

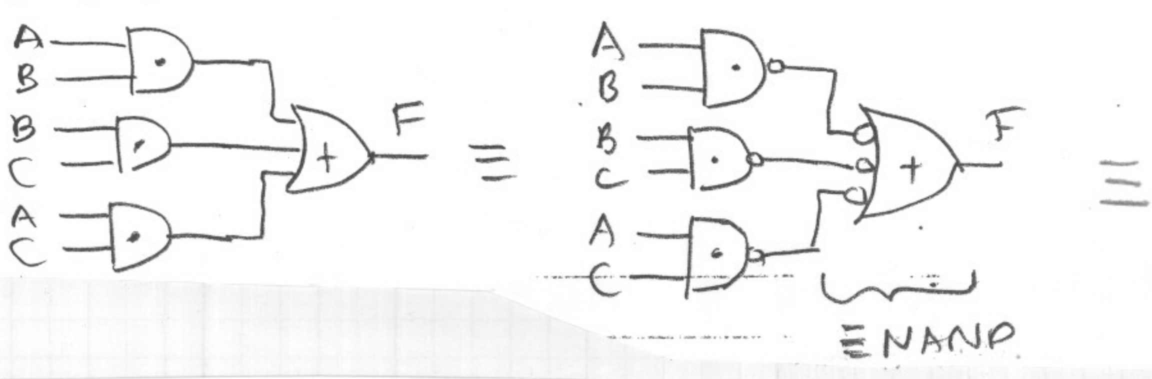
11.45

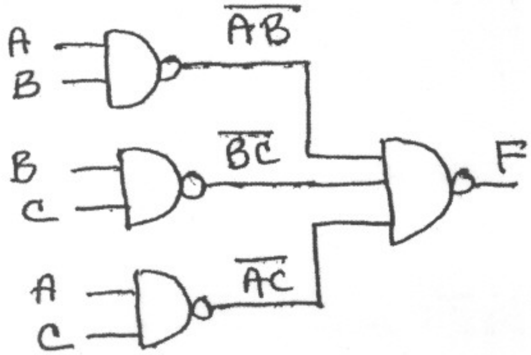
$F = AB + BC + AC$

Truth table

A	B	C	AB	BC	AC	F	Number of inputs that are high
0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1
0	1	0	0	0	0	0	1
0	1	1	0	1	0	1	2
1	0	0	0	0	0	0	1
1	0	1	0	0	1	1	2
1	1	0	1	0	0	1	2
1	1	1	1	1	1	1	3

Therefore, F is high when at least two of the three inputs are high. This means that F is the output of a three-input majority gate.





$$F = \overline{\overline{AB}\;\overline{BC}\;\overline{AC}}$$

$$= AB + BC + AC$$