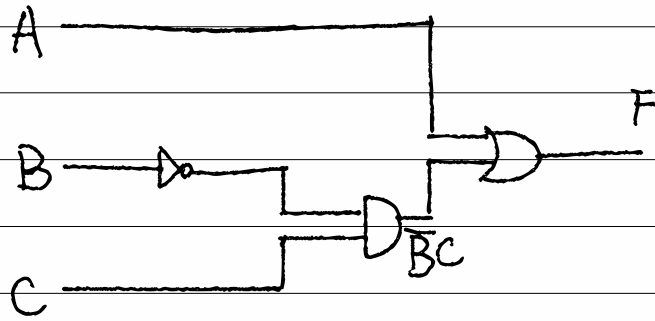
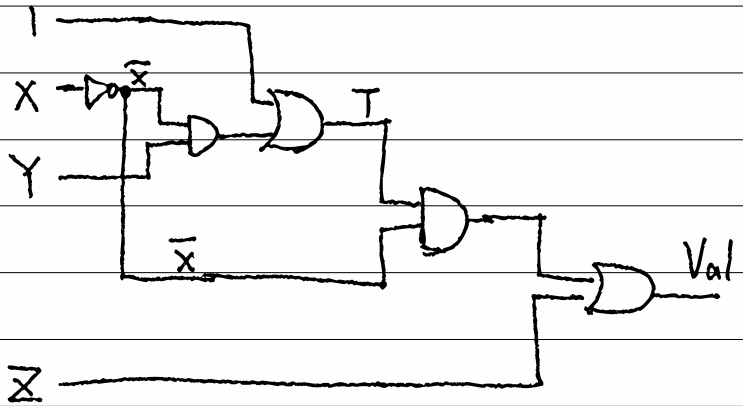
HW2

Q1.

tst Mod:



Big Mod.



Q2.

a). $F = \overline{\left(\overline{(A \oplus D)C} + B\right)(\bar{A}B + \bar{C}\bar{D})}$

subfunction: $A \oplus D = A\bar{D} + \bar{A}D$

$(A \oplus D)C = AC\bar{D} + \bar{A}CD$

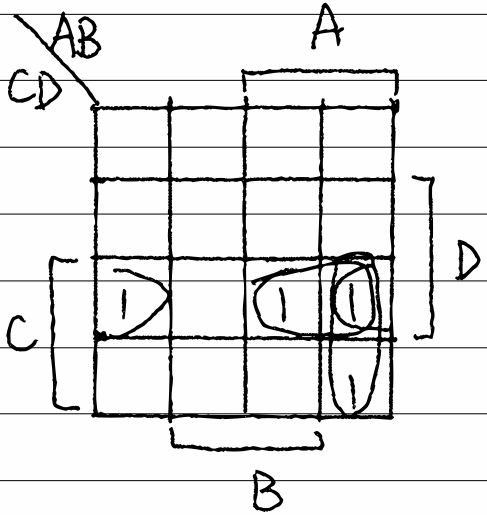
create a truth table:

A	B	C	D	$(A \oplus D)C$	$\overline{(A \oplus D)C} + B$	$\bar{A}B + \bar{C}\bar{D}$	F
0	0	0	0	0	1	1	0
0	0	0	1	0	1	1	0
0	0	1	0	0	1	1	0
0	0	1	1	1	0	0	1
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	0
0	1	1	0	0	1	1	0
0	1	1	1	1	1	1	0
1	0	0	0	0	1	1	0
1	0	0	1	0	1	1	0
1	0	1	0	1	0	1	1
1	0	1	1	0	1	0	1
1	1	0	0	0	1	1	0

A	B	C	D	$(A \oplus D)C$	$\overline{(A \oplus D)C} + B$	$\bar{A}B + \bar{C}\bar{D}$	F
1	1	0	1	0	1	1	0
1	1	1	0	1	1	1	0
1	1	1	1	0	1	0	1

$$F = \bar{A}\bar{B}CD + A\bar{B}C\bar{D} + A\bar{B}CD + ABCD$$

k- map

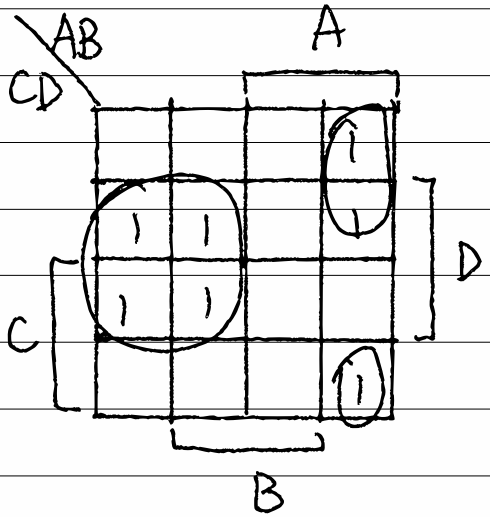


$$F = ACD + \bar{B}CD + A\bar{B}C$$

Q2 b)

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

$= \bar{A}\bar{B}CD + \bar{A}\bar{C}D + \bar{B}\bar{C}D + A\bar{B}\bar{C} + A\bar{B}\bar{D} + \bar{A}BCD$



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

Q3. a. 4-input minority gate

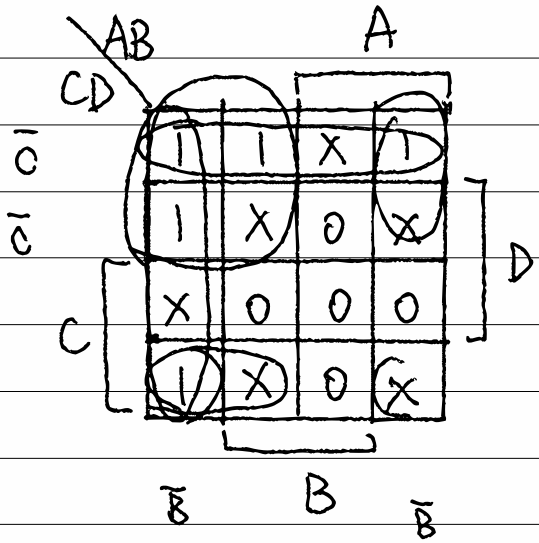
the truth table :

A	B	C	D	Output
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	X
0	1	0	0	1
0	1	0	1	X
0	1	1	0	X
0	1	1	1	0
1	0	0	0	1
1	0	0	1	X
1	0	1	0	X
1	0	1	1	0
1	1	0	0	X
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

16

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

$\bar{A}$ $\bar{A}$



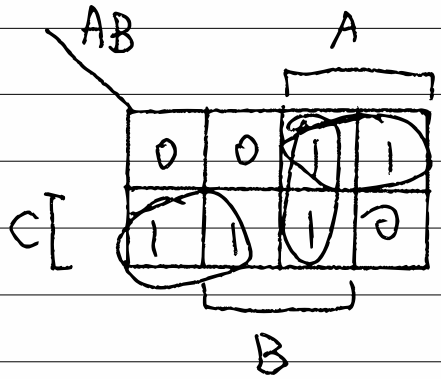
$\bar{A}\bar{B} + \bar{C}\bar{D}$

Q4

a). $F = \bar{B}C(A \oplus C) + AB + \bar{A}BC$

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

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

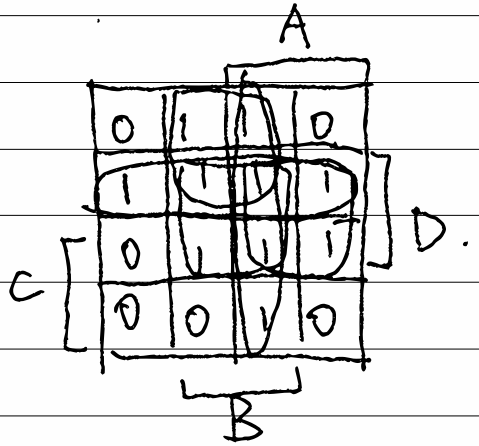


$F = \bar{A}C + AB + A\bar{C}$

Q4

b). $F = B(\bar{C} + D) + D(A + B) + \bar{C}D\overline{(A+B)} + A\bar{B}\bar{D}$

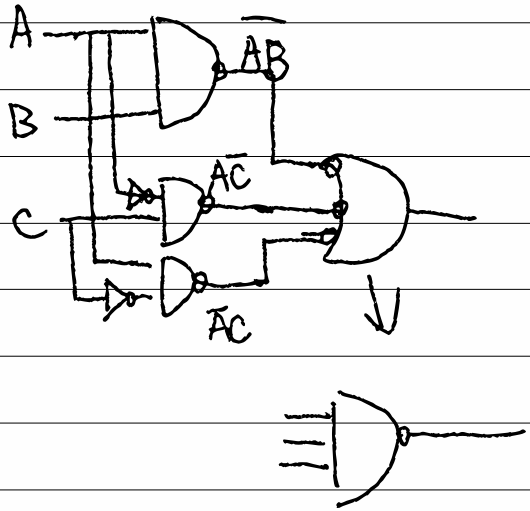
$= B\bar{C} + BD + DA + DB + \bar{A}\bar{B}CD + A\bar{B}\bar{D}$



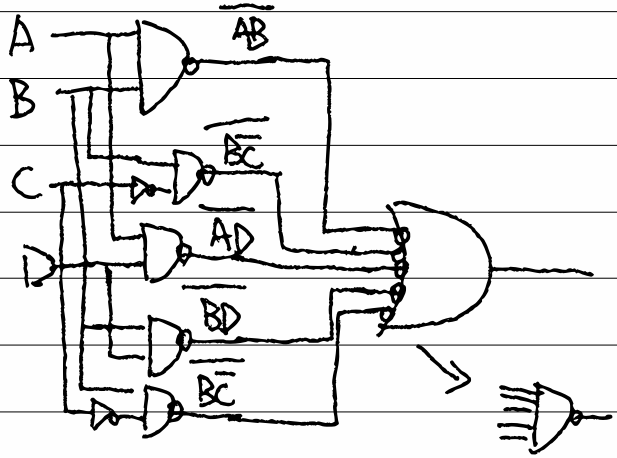
$F = \bar{C}D + B\bar{C} + BD + AD + AB$

Q5

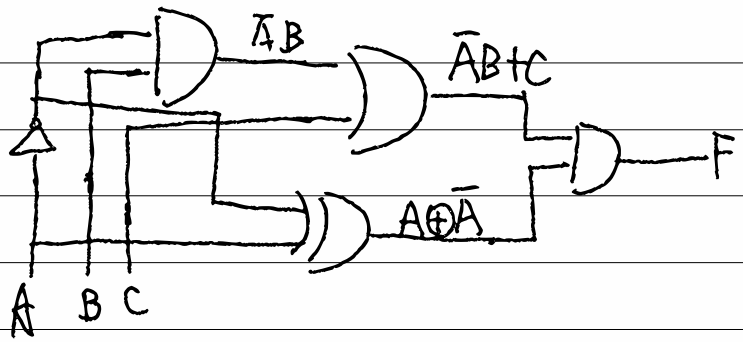
(a) $\bar{A}C + A\bar{C} + AB$



(b) $AB + AD + B\bar{C} + BD + \bar{C}D$



Q6.



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