Hw 6

1. $f(A,B,C,D) = \Sigma m(1,4,5,6,8,9,10,12,14)$

T-1

Group	Minterms	Variables A B C D
1	1	0 0 0 1
	4	0 1 0 0
	8	1 0 0 0
2	5	0 1 0 1
	6	0 1 1 0
	9	1 0 0 1
	10	1 0 1 0
	12	1 1 0 0
3	14	1 1 1 0

T-2

Group	Minterms	Variables A B C D
1	1,5	0 - 0 1
	1,9	- 0 0 1
	4,5	0 1 0 -
	4,6	0 1 - 0
	4,12	- 1 0 0
	8,9	1 0 0 -
	8,10	1 0 - 0
	8,12	1 - 0 0
2	6,14	- 1 1 0
	10,14	1 - 1 0
	12,14	1 1 - 0

T-3

Group	Minterms	Variables A B C D
1	4,12,6,14	- 1 - 0
	8,12,10,14	1 - - 0
	4,6,12,14	- 1 - 0
	8,10,12,14	1 - - 0

P.I.	Decimal	Minterms 1 4 5 6 8 9 10 12 14
B $\bar{D}$	4,12,6,14	(4) (6) (12) X X
A $\bar{D}$	8,12,10,14	(8) (12) X X

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

2. $f(A,B,C,D) = \Sigma m(0,6,9,10,13) + d(1,3,8)$

T-1

Group	Minterms	Variables A B C D
0	0	0 0 0 0
1	1	0 0 0 1
	8	1 0 0 0
2	3	0 0 1 1
	6	0 1 1 0
	9	1 0 0 1
	10	1 0 1 0
3	13	1 1 0 1

T-2

Group	Minterms	Variable
0	0,1	000-
	0,8	-000
1	1,3	00-1
	1,9	-001
	8,9	100-
	8,10	10-0
2	9,13	1-01

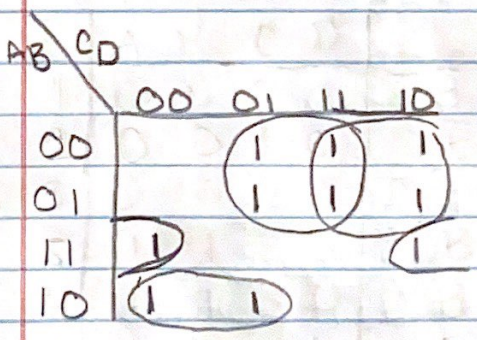
T-3

Group	Minterms	Variables
0	0,1,8,9	-00-

P.I.	Decimal	Minterms
$\bar{B}\bar{C}$	0,1,8,9	0, 6, 9, 10, 13 (0 ⊗, 9 ⊗)

$\boxed{y = \bar{B}\bar{C}}$

3. $f(A,B,C,D) = \Sigma m(1,2,3,5,6,7,8,9,12,14)$



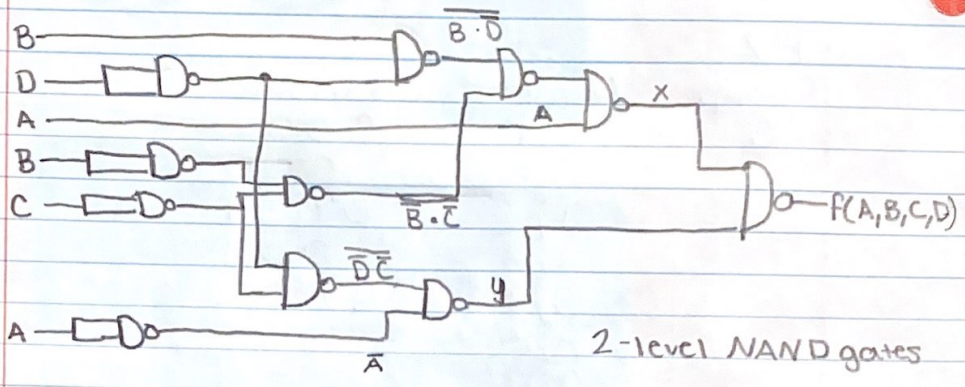
$= AB\bar{D} + A\bar{B}\bar{C} + \bar{A}D + \bar{A}C$

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

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

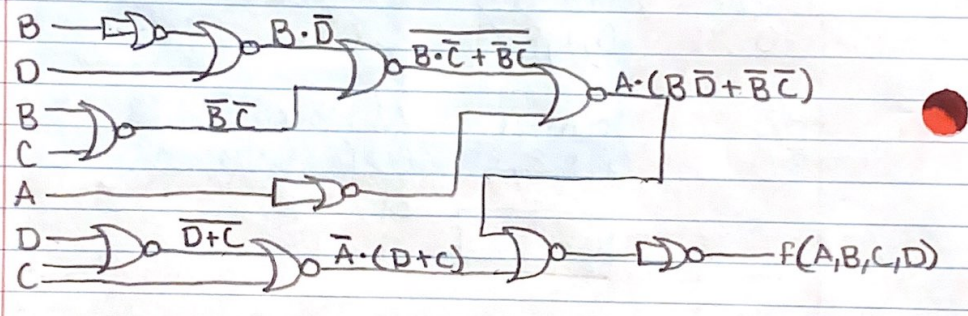
$= (\bar{A} + \overline{B\bar{D}} + \overline{\bar{B}\bar{C}}) \cdot (A + \overline{(D+C)})$

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



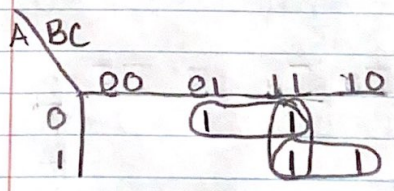
2-level NAND gates

4. f(A,B,C,D) in 2-level NOR gates



5. $f(A,B,C) = \bar{A}\bar{B}C + \bar{A}BC + AB\bar{C} + ABC$

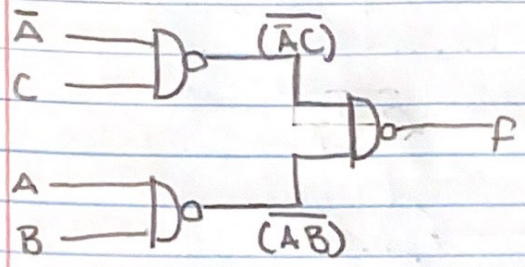
$P(A,B,C) = \Sigma m(1,3,6,7)$ NAND gate



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

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

$= (\overline{\bar{A}C}) \cdot (\overline{AB})$

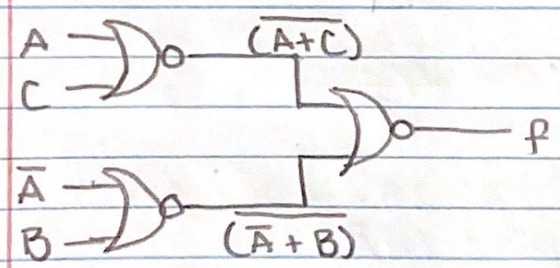


NOR gate

$f = \sum M(0,2,4,5)$

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

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

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

A \ BC	00	01	11	10
0	0			0
1	0	0