CS4341 Assignment 2

$0 \to \bar{A}$
$1 \to A$

1A.

		A	B	C	D	Y
0		0	0	0	0	0
1		0	0	0	1	0
2		0	0	1	0	0
3	*	0	0	1	1	1
4		0	1	0	0	0
5		0	1	0	1	0
6	*	0	1	1	0	1
7	*	0	1	1	1	1
8	*	1	0	0	0	1
9	*	1	0	0	1	1
10	*	1	0	1	0	1
11	*	1	0	1	1	1
12		1	1	0	0	0
13		1	1	0	1	0
14		1	1	1	0	0
15		1	1	1	1	0

AND

mark all Y=1, write any complement when there is 0.

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

The SOP Form is

AND

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

OR

$$Y=\Sigma(3,6,7,8,9,10,11)$$

① $\bar{A}\bar{B}+\bar{A}B=\bar{A}$
so $\bar{A}CD$

② $C\bar{D}+CD=C$
so ~~$\bar{A}BC$~~ $\bar{A}BC$

③ $\bar{C}\bar{D}+\bar{C}D+CD+C\bar{D}=1$
so only $A\bar{B}$

2B.

AB \ CD	00	01	11	10
00	0	0	1	0
01	0	0	1	1
11	0	0	0	0
10	1	1	1	1

After Simplification $\boxed{Y=\bar{A}CD+\bar{A}BC+A\bar{B}}$

2A). Write when $Y=0$, and $0 \rightarrow A$, $1 \rightarrow \bar{A}$ for POS Form.

		A	B	C	D	Y
0	*	0	0	0	0	0
1	*	0	0	0	1	0
2	*	0	0	1	0	0
3		0	0	1	1	1
4	*	0	1	0	0	0
5	*	0	1	0	1	0
6		0	1	1	0	1
7		0	1	1	1	1
8		1	0	0	0	1
9		1	0	0	1	1
10		1	0	1	0	1
11		1	0	1	1	1
12	*	1	1	0	0	0
13	*	1	1	0	1	0
14	*	1	1	1	0	0
15	*	1	1	1	1	0

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

$$= \Pi(0,1,2,4,5,12,13,14,15)$$

2B)

AB \ CD	00	01	11	10
00	0	0	1	0
01	0	0	1	1
11	0	0	0	0
10	1	1	1	1

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

Using De Morgan's Theorem, $\bar{\bar{Y}} = Y = (\bar{A}+\bar{B})\cdot(A+B+\bar{C}+D)\cdot(A+C)\cdot(\bar{B}+C)$

= Simplified POS Form.

CS4341 Assignment 2

3A) (i)

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

$= \bar{A}B(C+\bar{C})$ complements. (Theorem 5)

$= \bar{A}B$

(ii)

C \ AB	00	01	11	10
0	0	1	0	0
1	0	1	0	0

$= \boxed{\bar{A}B}$

(iii) Drawing on anothe file

3B) (i)

$Y = \overline{ABC} + A\bar{B}$

$= (\bar{A}+\bar{B}+\bar{C}) + A\bar{B}$ De Morgan's Law.

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

$= \bar{A} + \bar{B}(1+A) + \bar{C}$

$= \bar{A} + \bar{B} + \bar{C}$ Null Element

(ii)

C \ AB	00	01	11	10
0	1	1		1
1	1			1

$\Leftarrow \boxed{?}$

(iii) Drawing on another file.

3C.

(i) $Y = ABC\bar{D} + A\overline{BCD} + \overline{(\bar{A}+B+C+D)}$

$= ABC\bar{D} + A\overline{BCD} + \overline{ABCD}$ De'Morgans Law. (T12)

$= ABC\bar{D} + A(\bar{B}+\bar{C}+\bar{D}) + \overline{ABCD}$ De'Morgans law. (T12)

$= ABC\bar{D} + A\bar{B} + A\bar{C} + A\bar{D} + \overline{ABCD}$ Distributivity (T8)

$= A\bar{D}(BC+1) + A\bar{B} + A\bar{C} + \overline{ABCD}$ Associativity (T7)

$= A\bar{D} + A\bar{B} + A\bar{C} + \overline{ABCD}$ Null Element (T2)

$= \cancel{A(\overline{DBC}) + \bar{A}(\overline{BCD})}$

$= \cancel{A(\overline{BCD}) + \bar{A}(\overline{BCD})}$ ~~T7 T6~~

$= A(\bar{D}+\bar{B}+\bar{C}) + \overline{ABCD}$ ~~T6~~ T7

$= A(\overline{DBC}) + \overline{ABCD}$ De's Morgan

$= A(\overline{DBC}) + \bar{A}(\overline{BCD})$

$= (A+\bar{A})(\overline{BDC})$

$= \overline{BCD} = \bar{B}+\bar{C}+\bar{D}$

(ii)

AB \ CD		00	01	11	10
00		1			1
01					
11					
10				1	

E [?]

(iii) Drawing on another file

CS4341 Assignment 2

4A) $Y = \bar{A}D + A\bar{C}D + \bar{A}\bar{B}C + ABCD$

$Z = BD + A\bar{C}D.$

4B) K-map for Y

AB \ CD	00	01	11	10
00		1	1	
01		1	1	
11		1	1	
10		1	1	1

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

K-map for Z

AB \ CD	00	01	11	10
00				
01		1	1	
11		1	1	
10		1		

$Z = DB + A\bar{C}D$

Drawing on anothe file.