Tutorial - 6

1(i) $(AB)' + A' + AB$

$$= \overline{(\overline{A} + B + \overline{A} + AB)}$$

$$= (\overline{A} + \overline{B} + AB)'$$

$$= (A \cdot B)(A' + B') = 0$$

(ii) $(B + BC)(B + B'C)(B + D)$

$$B(1 + C)(B + B'C)(B + D)$$
$$= B(B + B'C)(B + D)$$
$$= B(B + B')(B + C)(B + D)$$
$$= B(B + C)(B + D)$$
$$= (BB + BC)(B + D)$$
$$= (B + BC)(B + D) = B.$$

(iii) $(x + y)(x + \overline{y})(\overline{x} + z)$
$$= (x + yy)(x' + z)$$
$$= x(x' + z) = xz$$

(iv) $(ABC + A'B + ABC')$
$$= AB(C + C') + A'B$$
$$= AB + A'B = B$$

(v)
$$ABCD + AB\bar{C}\bar{D} + ABC\bar{D} + ABCDE + AB\overline{CD}E + AB\bar{C}DE$$
$$= ABCD(1+E) + ABC\bar{D} + AB\bar{C}\bar{D}(1+\bar{E}) + AB\bar{C}D(1+E)$$
$$= ABCD + ABC\bar{D} + AB\bar{C}\bar{D} + AB\bar{C}D$$
$$= \cancel{ABCD} \quad ABD(C+\bar{C}) + AB\bar{D}(C+\bar{C})$$
$$= AB(D+\bar{D}) = AB$$

2a
$$F(A,B,C) = \Sigma m\,(1,2,4,6,7)$$
$$\bar{F} = \Sigma M\,(0,3,5)$$
$$F' = A'B'C' + A'BC + AB'C$$

2b
$$f = \Sigma m\,(0,2,6,11,13,14)$$
$$(ABCD)$$
$$= \Sigma m\,(1,3,4,5,7,8,9,10,12,15)$$
$$= A'B'C'D + AB'CD + A'BC'D' + A'BCD$$
$$+ AB'C'D + ABC'D + AB'CD' + AB'C'D' + ABCD$$

2c
$$F(x,y,z) = \Pi M\,(0,3,6,7)$$
$$\bar{F} = \Sigma m\,(0,3,6,7)$$
$$\bar{F} = x'y'z' + x'yz + xyz' + xyz$$

3(a)
$$f = \Sigma m\,(2,3,6,7)$$
$$F = xyz' + x'yz + xyz' + xyz$$

3b $\bar{F} = \Sigma M(0,1,4,5)$

$= x'y'z' + xy'z + xyz' + xy'z$ ①

3c $F = x'yz' + x'yz + xyz' + xyz$

$= x'y(z'+z) + xy(z'+z)$

$= x'y + xy$

$= y(x'+x) \Rightarrow f = y$

4·(a) $f = \Pi M(0,4,5,6,7,10,14)$

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

(b) $f = \Sigma M(2,8,9,10,11,12,14)$

$= AD' + AB' + B'CD'$

5. There are 2 answers.

①

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

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

②

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

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