# L7 practice problems

## Answers:

1.

a. F(X,Y,Z) = X'Y + X'Y'Z

= X'Y(Z' + Z) + X'Y'Z

= X'YZ' + X'YZ + X'Y'Z

= ∑ m (1, 2, 3)

b. F(A,B,C,D) = (((A+B')'+C)'+D)' - apply DeMorgans theorem

= A'BD' + CD'

= A'B (C+C') D' + (A'B' + A'B + AB' + AB) CD'

= A'B'CD' + A'BCD' + A'BC'D' + AB'CD' + ABCD'

= ∑ m (2, 6, 4, 10, 12)

= π M (0, 1, 3, 5, 7, 8, 9, 11, 12, 13, 15)

(a)

| X Y Z | F |
|---|---|
| 0 0 0 | 0 |
| 0 0 1 | 1 |
| 0 1 0 | 1 |
| 0 1 1 | 1 |
| 1 0 0 | 0 |
| 1 0 1 | 0 |
| 1 1 0 | 0 |
| 1 1 1 | 0 |

(b)

| A B C D | F |
|---|---|
| 0 0 0 0 | 0 |
| 0 0 0 1 | 0 |
| 0 0 1 0 | 1 |
| 0 0 1 1 | 0 |
| 0 1 0 0 | 1 |
| 0 1 0 1 | 0 |
| 0 1 1 0 | 1 |
| 0 1 1 1 | 0 |
| 1 0 0 0 | 0 |
| 1 0 0 1 | 0 |
| 1 0 1 0 | 1 |
| 1 0 1 1 | 0 |
| 1 1 0 0 | 0 |
| 1 1 0 1 | 0 |
| 1 1 1 0 | 1 |
| 1 1 1 1 | 0 |

2. F(X, Y, Z) = ∑ m (1, 2, 3)

3. F(A, B, C, D) = π M (0, 1, 3, 5, 7, 8, 9, 11, 12, 13, 15)

4a. $Z = ABC + AB'(A'C')'$

$= ABC + AB'(A'' + C'')$ - DeMorgan's theorem

$= ABC + AB' + AB'C$

$= ABC + AB' (1 + C)$

$= ABC + AB'$

$= A(BC + B')$ - apply absorption law $X+X'Y = X+Y$

$= A(C + B')$

$= AC + AB'$ (SOP)

4b. $X = (A' + B)(A + B + D)D'$

$= (AA' + A'B + A'D + AB + BB + BD)D'$

$= (A'B + AB + B + A'D + BD)D'$

$= (B(1 + A' + A) + A'D + BD)D'$

$= (B + A'D + BD)D'$

$= BD' + A'DD' + BDD'$

$= BD' + 0 + 0$

$= BD'$ (SOP)