

Q.28 Develop SOP and POS for f_1, f_2, f_3

X	Y	Z	f_1	OUTPUT	f_3
0	0	0	0	0	1
0	0	1	0	1	1
0	1	0	1	1	1
0	1	1	1	1	0
1	0	0	1	0	0
1	0	1	0	1	0
1	1	0	1	1	1
1	1	1	1	0	1

f_1 SOP Expression

$$\begin{aligned}
 &= \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}\bar{z} + x\bar{y}z + x\bar{y}z \\
 &= y\bar{z} + yz + x\bar{y}z \\
 &= y + x\bar{y}z
 \end{aligned}$$

POS Expression

$$\begin{aligned}
 &x \cdot y \cdot z + x \cdot y \cdot \bar{z} + \bar{x} \cdot y \cdot \bar{z} \\
 &= (x + y + z) \cdot (x + y + \bar{z}) \cdot (\bar{x} + y + \bar{z}) \\
 &= x + y + (z \cdot \bar{z}) \\
 &= x + y + (z \cdot \bar{z}) \\
 &= \bar{y} \cdot \bar{x} + y + z
 \end{aligned}$$

f2 SOP Expression

$$= \bar{x}\bar{y}z + \bar{x}y\bar{z} + \bar{x}yz + x\bar{y}\bar{z} + xy\bar{z}$$

$$= \bar{y}z + \bar{x}y + xy\bar{z}$$

$$= \bar{y}z + y(\bar{x} + x\bar{z})$$

$$= \bar{y}z + y\bar{z}$$

POS Expression

$$= \bar{y} + z \cdot y + z$$

F3

POS Expression

$$= \bar{x}\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}y\bar{z} + x\bar{y}\bar{z} + xy\bar{z}$$

$$= \bar{x}\bar{y} + \bar{x}y\bar{z} + xy$$

$$= \bar{x}(\bar{y} + y\bar{z}) + xy$$

$$= \bar{x}\bar{z} + xy$$

SOP Expression

$$= \bar{x} + \bar{y} \cdot x + z$$

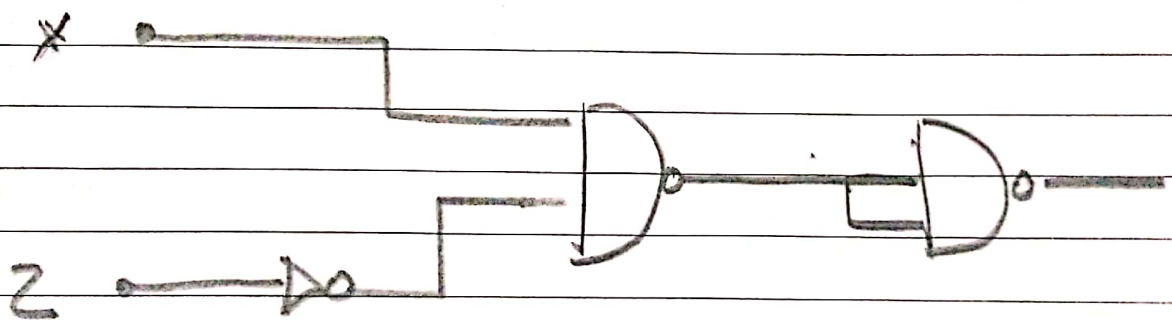
Q 29

SOP and POS of expression that then simplify both expressions using only NAND gates for the SOP NOR gates only for sums.

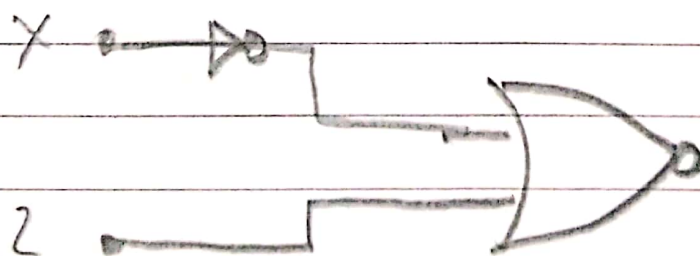
$$f1 = \bar{Y} + X\bar{Y}\bar{Z}$$

$$= \cancel{X} \cdot \cancel{Z} \cdot \bar{Y} + \bar{Y}$$

$$= X\bar{Z} = \overline{X+Z}$$

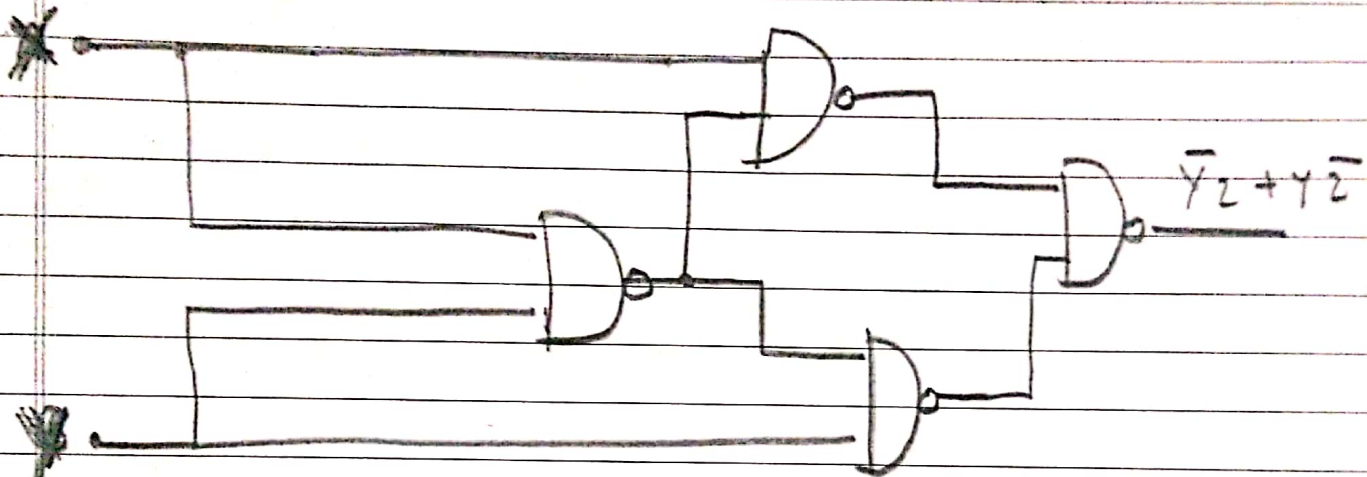


$$= \bar{X} + Z = \overline{(\bar{X} + Z)} =$$



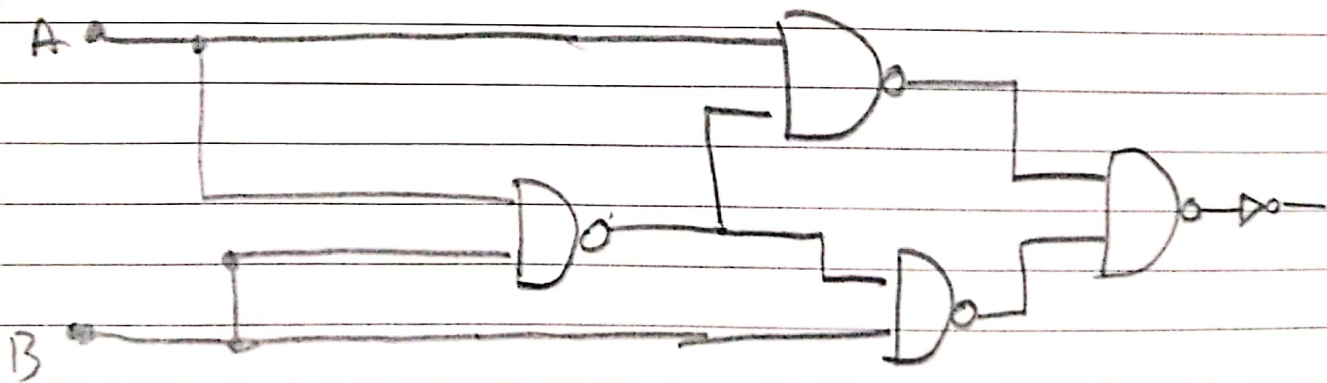
Q

$$f_2 = \bar{A}B + A\bar{B}$$
$$= \bar{Y}Z + Y\bar{Z}$$

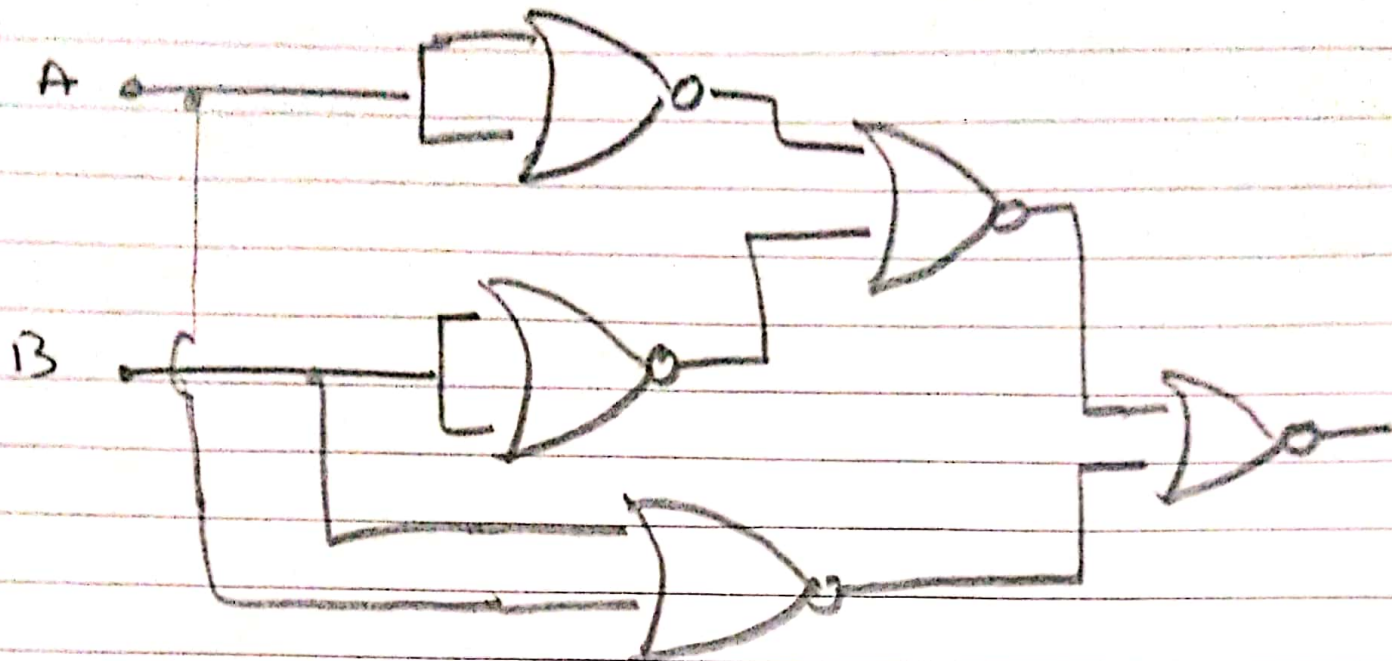


$$f_2 = \bar{A}\bar{B} + AB$$

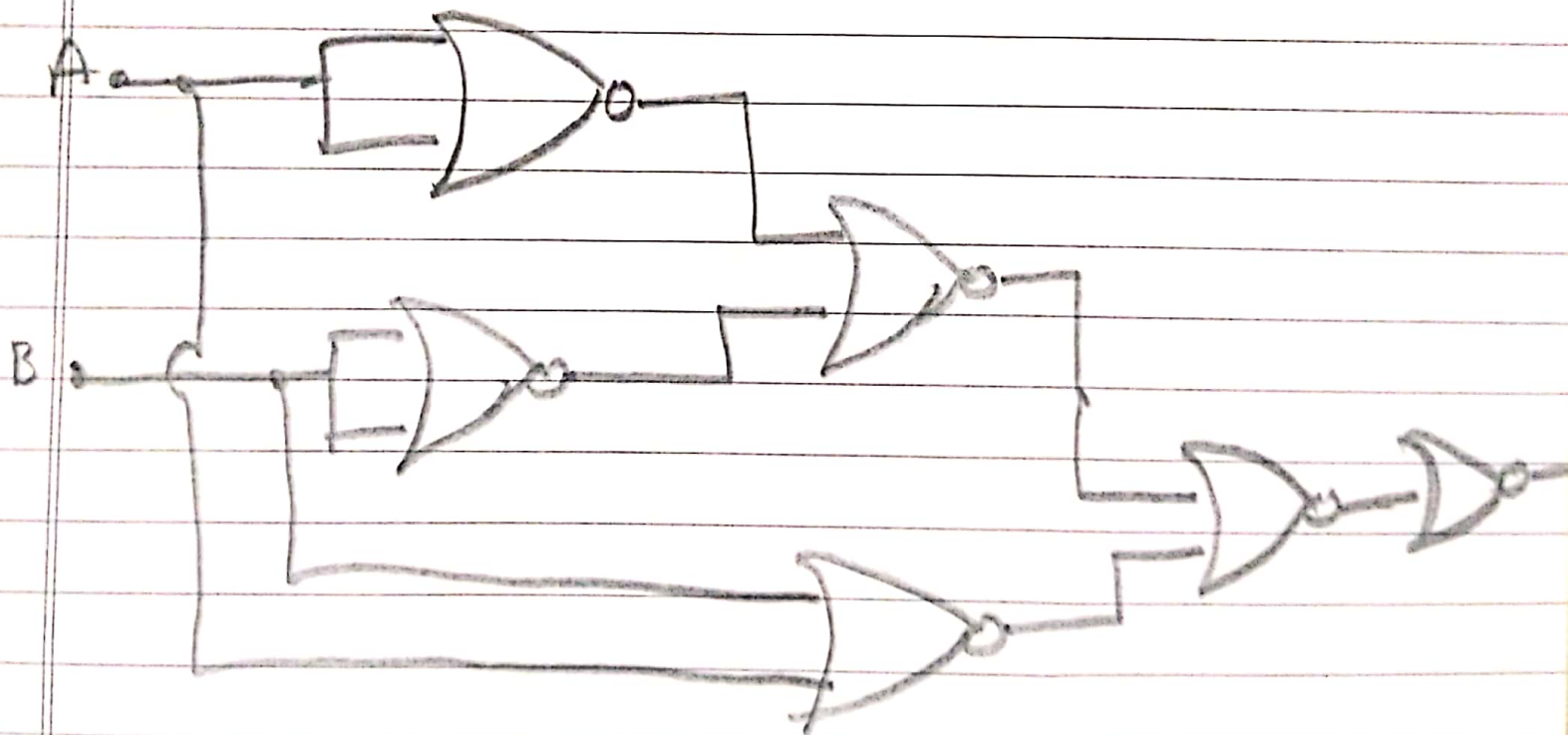
NAND GATES



$$= AB' + A'B$$



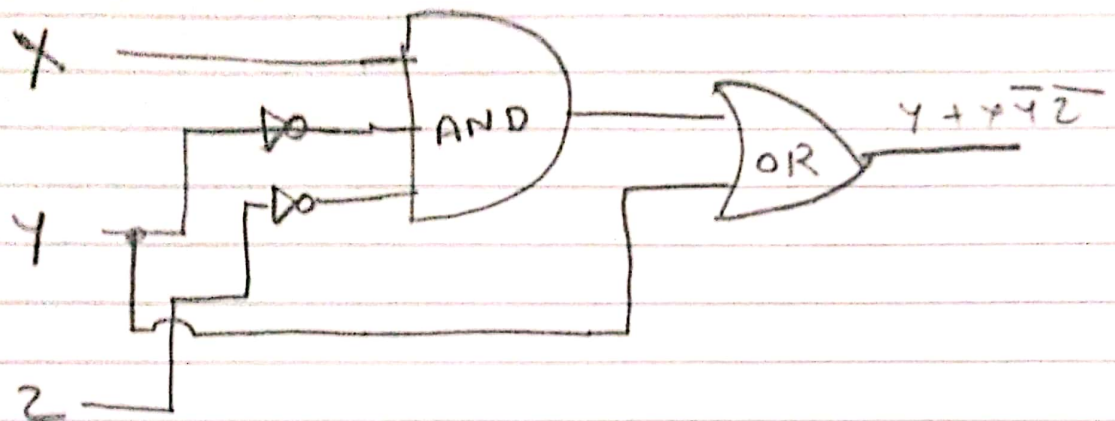
$$= AB + A'B'$$



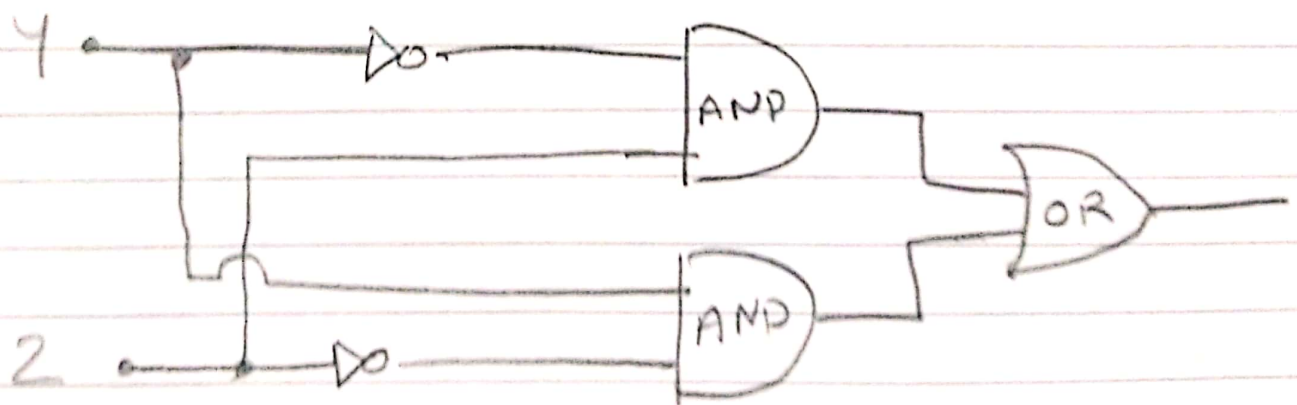
Q. 3.34

Draw block diagrams for f_1, f_2, f_3 in Question 3.28 using AND to NOR gate.

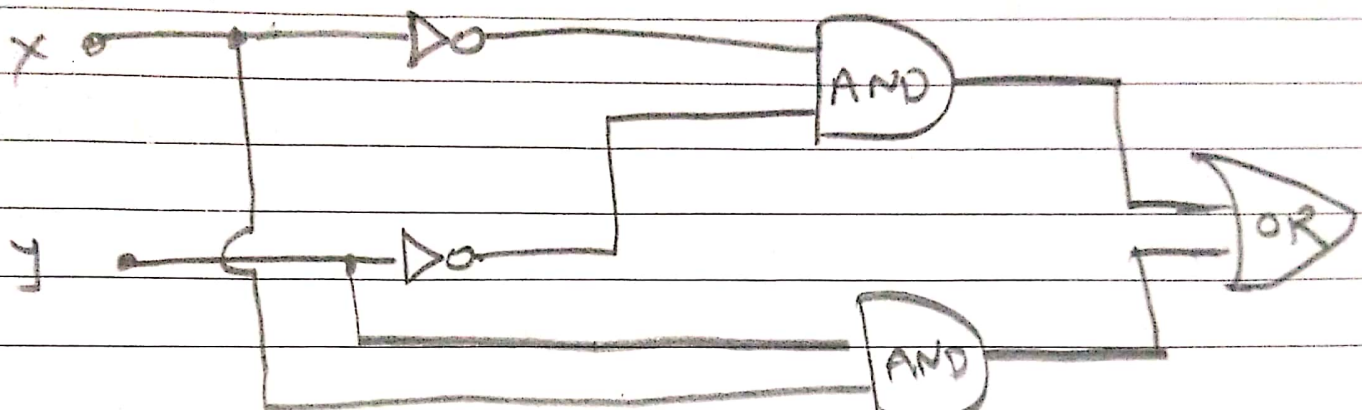
1) $Y + X \bar{Y} \bar{Z}$



2) $\bar{Y} \bar{Z} + Y \bar{Z}$



3) $\bar{x}\bar{z} + xy$



Q 3.35

Draw the K-maps for the 3.2

A) $\bar{x}\bar{y} + \bar{x}y$

\bar{y}	\bar{x}	x
y	1	0
y	1	0

e) $\bar{x}\bar{y} + \bar{y}z$

$\bar{x}\bar{y}$	$\bar{x}y$	xy	$x\bar{y}$
\bar{z}	1	0	1
z	1	0	0

B) $xy\bar{z} + \bar{x}\bar{y}z$

xy	$\bar{x}\bar{y}$	$\bar{x}y$	xy	$x\bar{y}$
\bar{z}	0	0	1	0
z	1	0	0	0

C) $\bar{x}y\bar{z} + x\bar{y}$

xy	$\bar{x}\bar{y}$	$\bar{x}y$	xy	$x\bar{y}$
\bar{z}	0	1	0	1
z	0	0	0	1

d) $\bar{x}\bar{y}\bar{z} + x\bar{y}\bar{z} + \bar{x}y\bar{z}$

xy	$\bar{x}\bar{y}$	$\bar{x}y$	xy	$x\bar{y}$
\bar{z}	1	1	0	1
z	0	0	0	0

8.37

A)

$$XY + \bar{X}\bar{Y}$$

$\begin{matrix} X & Y \\ \hline \end{matrix}$	\bar{X}	Y
1	1	1
1	0	0

(B)

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

$\begin{matrix} A & B \\ \hline \end{matrix}$	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
1	1	0	0	1
0	0	0	0	0

C)

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

$\begin{matrix} A & B \\ \hline \end{matrix}$	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
1	0	0	0	0
0	0	0	1	1

d)

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

$\begin{matrix} A & B \\ \hline \end{matrix}$	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
1	0	0	1	1
0	0	0	1	1

e) $ABC + \bar{A}\bar{B}\bar{C} + A\bar{B}C$

C \ AB				
	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
\bar{C}	1	0	0	0
C	0	0	1	1

(f)

C \ AB				
	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
\bar{C}	1	0	0	0
C	0	1	1	0

$$3.40 \quad Ay + Ay = A$$

$$4) \quad xy + \overline{xy} \\ = \overline{0} = \overline{y}$$

$$b) \quad \overline{A}\overline{B}C + A\overline{B}C \\ = \overline{B}C$$

$$c) \quad A\overline{B}C + ABC \\ = AC$$

$$d) \quad \overline{A}BC + A\overline{B}C + A\overline{B}C + A\overline{B}C \\ = AB + A\overline{B} \\ = A$$

$$e) \quad \overline{A}BC + \overline{A}\overline{B}C + A\overline{B}C \\ = AC + \overline{A}\overline{B}C$$

$$f) \quad A \underline{B} C + \bar{A} \underline{B} C + \bar{A} \bar{B} \bar{C}$$

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

Q.51 Draw the K maps in XYZ

① $m_0 + m_1 + m_5 + m_7$

$= \bar{X}\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z + X\bar{Y}\bar{Z} + X\bar{Y}Z$

XY \ Z	$\bar{X}\bar{Y}$	$\bar{X}Y$	$X\bar{Y}$	XY
\bar{Z}	1	1	1	
Z	1		1	1

$= \bar{X}\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z + X\bar{Y}\bar{Z} + X\bar{Y}Z = X\bar{Y} + XZ$

② $m_1 + m_3 + m_5 + m_7$

$= \bar{X}Y\bar{Z} + \bar{X}YZ + X\bar{Y}\bar{Z} + XY\bar{Z}$

XY \ Z	$\bar{X}\bar{Y}$	$\bar{X}Y$	$X\bar{Y}$	XY
\bar{Z}				1
Z	1	1		1

$= Y\bar{Z} + XY$

x	y	z	BoP
0	0	0	m_0
0	0	1	m_1
0	1	0	m_2
0	1	1	m_3
1	0	0	m_4
1	0	1	m_5
1	1	0	m_6
1	1	1	m_7

(c) $m_1 + m_2 + m_3 + m_5$

	$x\bar{y}$	$\bar{x}\bar{y}$	$\bar{x}y$	$x\bar{y}$
\bar{z}	0	1	0	1
z	1	0	0	1

$$= \bar{x}\bar{y}\bar{z} + x\bar{y} + \bar{y}z$$

(d) $m_0 + m_5 + m_7$

	$\bar{x}\bar{y}$	$\bar{x}y$	$x\bar{y}$	$x\bar{y}$
\bar{z}	1	0	0	0
z	0	0	1	1

$$= \bar{x}\bar{y}\bar{z} + xz$$

3.49

1)

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

Don't + Care

$\bar{A}\bar{B}$	$\bar{A}B$	$A\bar{B}$	AB
\bar{C}	1	0	0
C	0	0	1

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

2)

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

Don't + Care

$\bar{A}\bar{B}$	$\bar{A}B$	$A\bar{B}$	AB
\bar{C}	1	0	0
C	0	0	1

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

3)

$$ABCD + \bar{A}\bar{B}\bar{C}D + \bar{A}BCD + A\bar{B}CD + \bar{A}\bar{B}CD + \underbrace{ABC\bar{D}}_{\text{Don't}}$$

AB \ CD	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
$\bar{C}\bar{D}$	0	0	0	0
$\bar{C}D$	1	0	0	0
$C\bar{D}$	0	1	1	0
CD	0	0	0	0

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