CS 350 Lab 4

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1) $\overline{(x\bar{y}+z)}$

a) Minimal DNF

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

b) Equivalent Full DNF

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

x	y	z	$\bar{y}$	$x\bar{y}$	$(x\bar{y}+z)$	$\overline{(x\bar{y}+z)}$	$\bar{x}\bar{y}\bar{z} + \bar{x}y\bar{z} + xy\bar{z}$
0	0	0	1	0	0	1	1
0	0	1	1	0	1	0	0
0	1	0	0	0	0	1	1
0	1	1	0	0	1	0	0
1	0	0	1	1	1	0	0
1	0	1	1	1	1	0	0
1	1	0	0	0	0	1	1
1	1	1	0	0	0	1	1

②

X	Y	Z	R
0	0	0	0 ✓
0	0	1	1 ✓
0	1	0	1 ✓
0	1	1	0 ✓
1	0	0	1 ✓
1	0	1	1 ✓
1	1	0	0 ✓
1	1	1	1 ✓

a)

xy \ z	0	1
00	0	1
01	1	0
11	0	1
10	1	1

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

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

$x\bar{y} + xz + \cancel{\bar{x}yz} + \bar{x}\bar{y}z$

simple: $\bar{y} + z$

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

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

③

	V	X	Y	Z	R
	0	0	0	0	1
	0	0	0	1	0
✓	0	0	1	0	0
	0	0	1	1	1
	0	1	0	0	1
	0	1	0	1	1
	0	1	1	0	1
	0	1	1	1	0
	1	0	0	0	1
	1	0	0	1	0
	1	0	1	0	0
	1	0	1	1	1
	1	1	0	0	0
	1	1	0	1	1
	1	1	1	0	1
	1	1	1	1	0

a)

VX \ YZ	00	01	11	10
00	1	0	1	0
01	1	1	0	1
11	0	1	0	1
10	1	0	1	0

b)

$VXYZ + V\bar{X}YZ = VYZ$

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

$\bar{V}\bar{X}YZ + \bar{V}XYZ = \bar{X}YZ$

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

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

c)

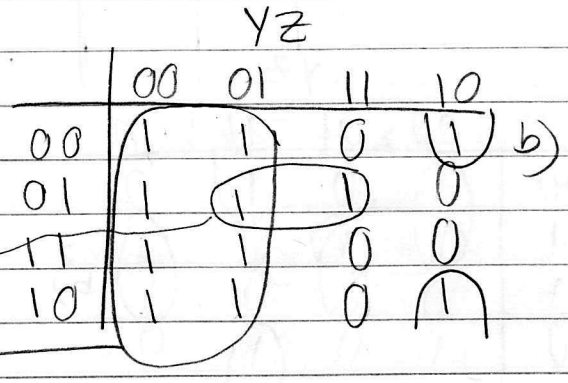
$VYZ + V\bar{X}Y + \bar{X}YZ + X\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z$

$\boxed{VZ + V\bar{X} + \bar{X}Y}$

④

V	X	Y	Z	R
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	0
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	0

a)



c) ~~$\bar{V}\bar{X}\bar{Y}\bar{Z} + \bar{V}\bar{X}\bar{Y}Z + \bar{V}\bar{X}Y\bar{Z} + \bar{V}\bar{X}YZ + V\bar{X}\bar{Y}\bar{Z} + V\bar{X}\bar{Y}Z + V\bar{X}Y\bar{Z} + VXY\bar{Z}$~~

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

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

$$\boxed{Y + V\bar{X}\bar{Z} + X\bar{Y}Z}$$

$$= \boxed{Y + V\bar{X} + X\bar{Y}}$$

⑤ $R = VX(\overline{VX\bar{Y}Z}) + XZ + VXY + \bar{Y}(\overline{XZ}) + VY\bar{Z} + \bar{V}\bar{Z}$

V	X	Y	Z	$\bar{Y}$	$\overline{VX\bar{Y}Z}$	VX	$VX(\overline{VX\bar{Y}Z})$	XZ	VXY	$\overline{XZ}$	$\bar{Y}(\overline{XZ})$	$VY\bar{Z}$	$\bar{V}\bar{Z}$	R
0	0	0	0	1	1	0	0	0	0	1	1	0	1	1
0	0	0	1	1	1	0	0	0	0	1	1	0	0	1
0	0	1	0	0	1	0	0	0	0	1	0	0	1	1
0	0	1	1	0	1	0	0	0	0	1	0	0	0	0
0	1	0	0	1	1	0	0	0	0	1	1	0	1	1
0	1	0	1	1	1	0	0	1	0	0	0	0	0	1
0	1	1	0	0	1	0	0	0	0	1	0	0	1	1
0	1	1	1	0	1	0	0	1	0	0	0	0	0	1
1	0	0	0	1	1	0	0	0	0	1	1	0	0	1
1	0	0	1	1	1	0	0	0	0	1	1	0	0	1
1	0	1	0	0	1	0	0	0	0	1	0	1	0	1
1	0	1	1	0	1	0	0	0	0	1	0	0	0	0
1	1	0	0	1	1	1	1	0	0	1	1	0	0	1
1	1	0	1	1	1	1	1	0	0	0	0	0	1	1
1	1	1	0	0	1	1	1	0	0	1	0	1	0	1
1	1	1	1	0	1	1	1	1	1	0	0	0	0	1

a)

VX \ YZ	00	01	11	10
00	1	1	0	1
01	1	1	1	1
11	1	1	1	1
10	1	1	0	1

b)

c) ~~$\bar{V}\bar{X}\bar{Y}\bar{Z} + \bar{V}\bar{X}\bar{Y}Z + \bar{V}\bar{X}Y\bar{Z} + \bar{V}\bar{X}YZ + V\bar{X}\bar{Y}\bar{Z} + V\bar{X}\bar{Y}Z + V\bar{X}Y\bar{Z} + \bar{V}X\bar{Y}\bar{Z}$~~

(y)

$\bar{V}XYZ + VXYZ = (XYZ)$

~~$\bar{V}\bar{X}Y\bar{Z} + \bar{V}X\bar{Y}\bar{Z} + V\bar{X}Y\bar{Z} + VX\bar{Y}\bar{Z} = Y\bar{Z}$~~

$y + XYZ + Y\bar{Z} = \boxed{y + XY}$