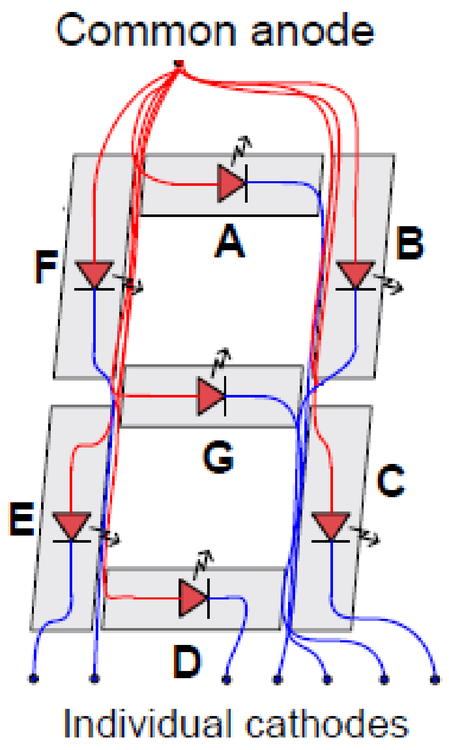
Problem 1

I3	I2	I1	I0	A	B	C	D	E	F	G
0	0	0	0	0	0	0	0	0	0	1
0	0	0	1	1	0	0	1	1	1	1
0	0	1	0	0	0	1	0	0	1	0
0	0	1	1	0	0	0	0	1	1	0
0	1	0	0	1	0	0	1	1	0	0
0	1	0	1	0	1	0	0	1	0	0
0	1	1	0	0	1	0	0	0	0	0
0	1	1	1	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0
1	0	0	1	0	0	0	1	1	0	0
1	0	1	0	0	0	0	1	0	0	0
1	0	1	1	1	1	0	0	0	0	0
1	1	0	0	1	1	1	0	0	1	0
1	1	0	1	1	0	0	0	0	1	0
1	1	1	0	0	1	1	0	0	0	0
1	1	1	1	0	1	1	1	0	0	0



1. Fill the truth table for an active low seven segment decoder **Hint:** we will use lower case letters for 11, 12, 13 and upper case letters for 10, 14, and 15.
2. Using four variable K-maps find the most simplified minterms expressions for LEDs A to D.
3. Using four variable K-maps find the most simplified maxterms expressions for LEDs E to G.

Problem 2

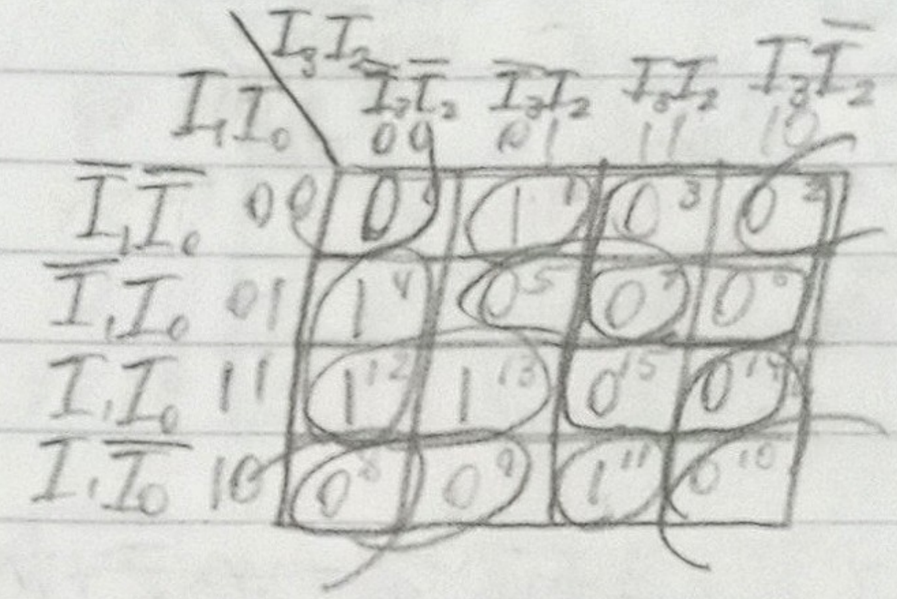
1. Repeat problem 1 assuming BCD input which limits the digits between 0 and 9 and the rest are don’t care.
2. Comment on how much the “don’t care” inputs helped you to reduce your expressions.

Many of expressions were reduced by a lot, while a few were minimally reduced. Overall, setting our 7-segment to display to only numbers 0-9 (BCD) made our expressions more concise and therefore made our full logic circuit simpler.

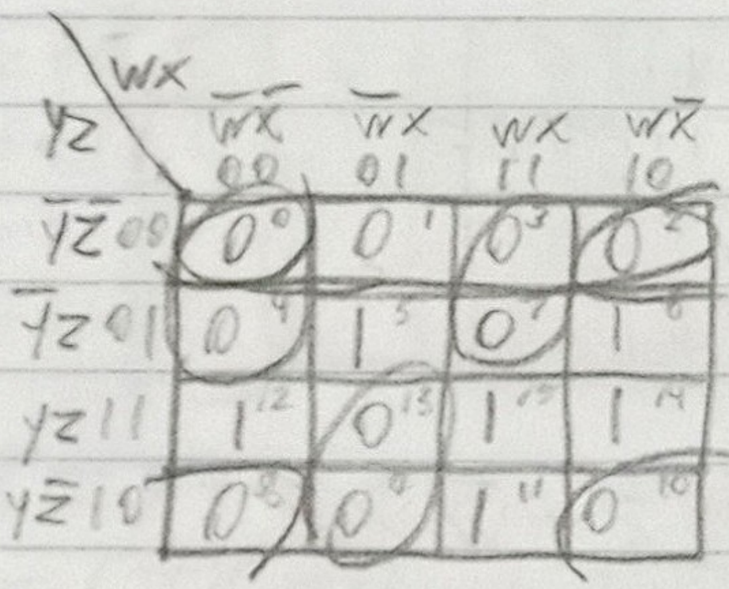
Homework 4

Problem 1

2)



$$A = \bar{I}_2\bar{I}_0 + I_0I_3 + \bar{I}_1I_3 + I_2\bar{I}_1I_0 + \bar{I}_3I_1\bar{I}_0$$
$$A = (I_2+I_0)(\bar{I}_0+\bar{I}_3)(\bar{I}_1+\bar{I}_3)(\bar{I}_2+I_1+\bar{I}_0)(I_3+\bar{I}_1+I_0)$$

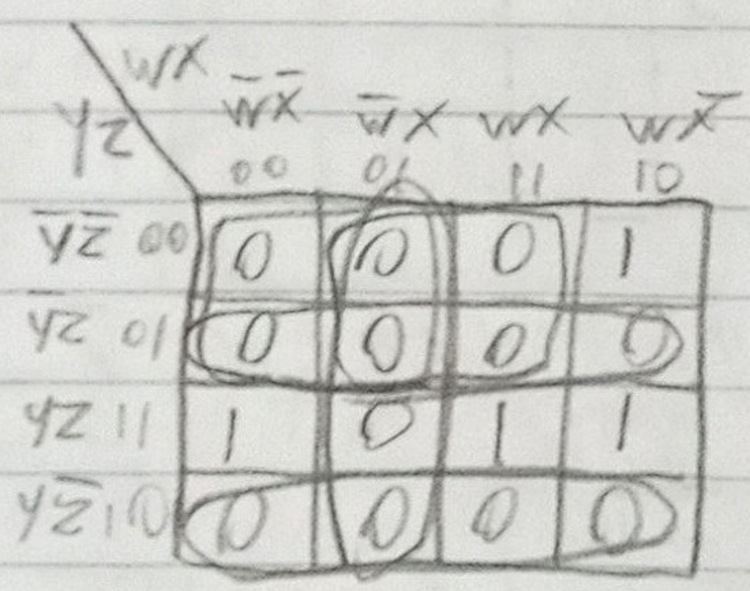


I is suck, so...

$W = I_3$
$X = I_2$
$Y = I_1$
$Z = I_0$

I hope this helps

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



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

YZ \ WX	$\bar{W}\bar{X}$ 00	$\bar{W}X$ 01	WX 11	$W\bar{X}$ 10
$\bar{Y}\bar{Z}$ 00	0	1	0	0
$\bar{Y}Z$ 01	1	0	1	0
YZ 11	0	0	1	0
$Y\bar{Z}$ 10	0	1	0	1

$D = \bar{W}X\bar{Y} + \bar{X}\bar{Y}\bar{Z} + \bar{W}XZ + WX\bar{Z} + WY\bar{Z} + W\bar{X}Z$

$D = (W+X+\bar{Y})(X+Y+\bar{Z})(W+\bar{X}+\bar{Z})(\bar{W}+\bar{X}+Z)(\bar{W}+Y+\bar{Z})$
$(\bar{W}+X+\bar{Z})$

3)

YZ \ WX	$\bar{W}\bar{X}$ 00	$\bar{W}X$ 01	WX 11	$W\bar{X}$ 10
$\bar{Y}\bar{Z}$ 00	0	1	1	0
$\bar{Y}Z$ 01	1	0	1	0
YZ 11	0	0	0	0
$Y\bar{Z}$ 10	0	1	0	0

$E = X\bar{Y} + \bar{W}YZ + \bar{W}X\bar{Z}$

Y \ WX	$\bar{W}\bar{X}$ 00	$\bar{W}X$ 01	WX 11	$W\bar{X}$ 10
$\bar{Y}\bar{Z}$ 00	0	1	1	1
$\bar{Y}Z$ 01	0	0	1	0
YZ 11	1	1	0	0
$Y\bar{Z}$ 10	0	0	0	0

$F = \bar{W}YZ + X\bar{Y}\bar{Z} + W\bar{Y}\bar{Z} + WX\bar{Y}$

Y \ WX	$\bar{W}\bar{X}$ 00	$\bar{W}X$ 01	WX 11	$W\bar{X}$ 10
$\bar{Y}\bar{Z}$ 00	1	1	0	0
$\bar{Y}Z$ 01	0	0	1	0
YZ 11	0	0	0	0
$Y\bar{Z}$ 10	0	0	0	0

$G = \bar{W}YZ + WX\bar{Y}Z$

Problem 2

yz \ wx	$\bar{w}\bar{x}$ 00	$\bar{w}x$ 01	wx 11	$w\bar{x}$ 10
$\bar{y}\bar{z}$ 00	0	1	0	0
$\bar{y}z$ 01	1	0	0	0
yz 11	x	x	x	x
$y\bar{z}$ 10	0	0	x	x

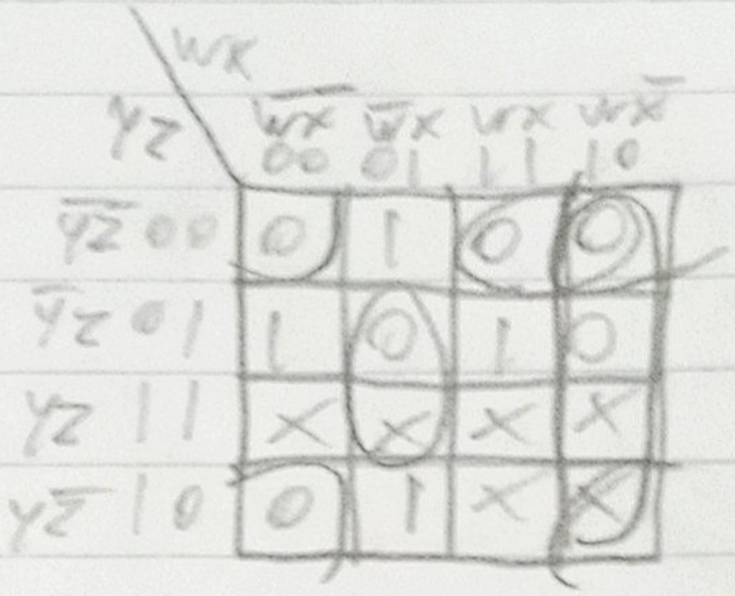
$$A = w + y + xz + \bar{x}\bar{z}$$
$$A = (\bar{w})(\bar{y})(\bar{x}+\bar{z})(x+z)$$

yz \ wx	$\bar{w}\bar{x}$ 00	$\bar{w}x$ 01	wx 11	$w\bar{x}$ 10
$\bar{y}\bar{z}$ 00	0	0	0	0
$\bar{y}z$ 01	0	1	0	1
yz 11	x	x	x	x
$y\bar{z}$ 10	0	0	x	x

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

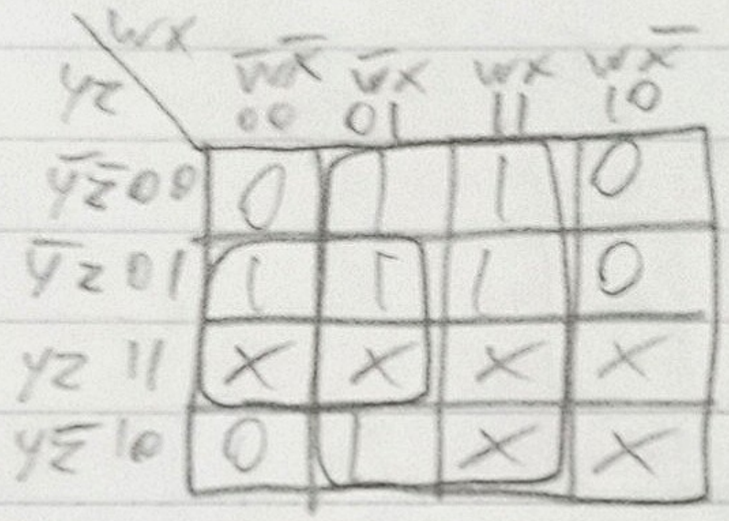
yz \ wx	$\bar{w}\bar{x}$ 00	$\bar{w}x$ 01	wx 11	$w\bar{x}$ 10
$\bar{y}\bar{z}$ 00	0	0	0	1
$\bar{y}z$ 01	0	0	0	0
yz 11	x	x	x	x
$y\bar{z}$ 10	0	0	x	x

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

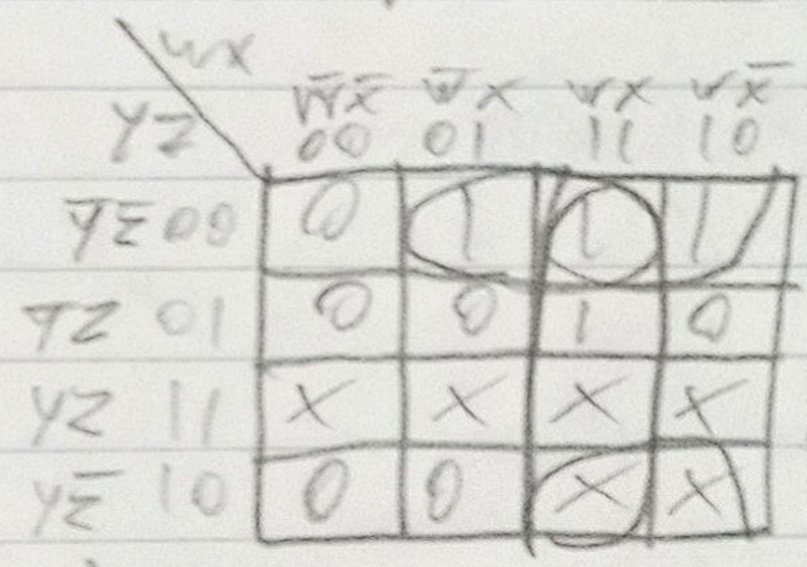


$D = w\bar{x} + \bar{x}\bar{z} + \bar{w}xz + wy\bar{z}$

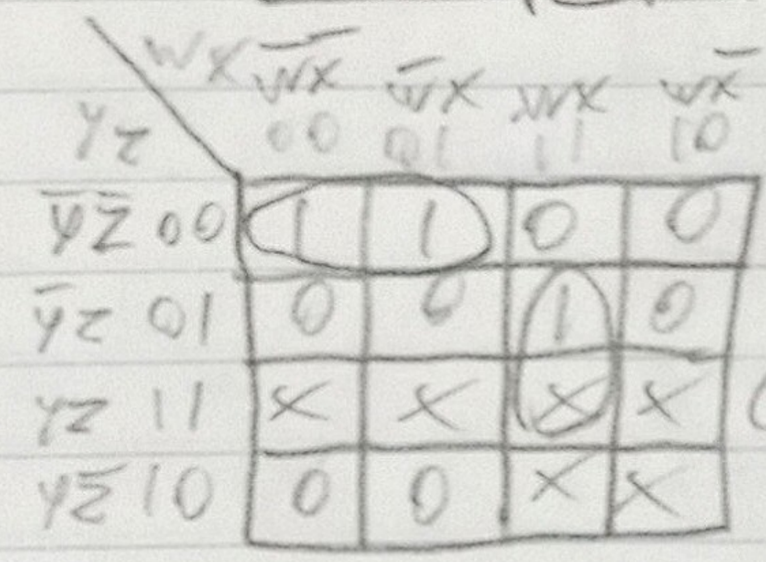
$D = (\bar{w}+x)(x+z)(w+\bar{x}+\bar{z})(\bar{w}+y+z)$



$E = x + \bar{w}z$



$F = wy + wx + x\bar{y}\bar{z}$



$G = \bar{w}\bar{y}\bar{z} + wxz$