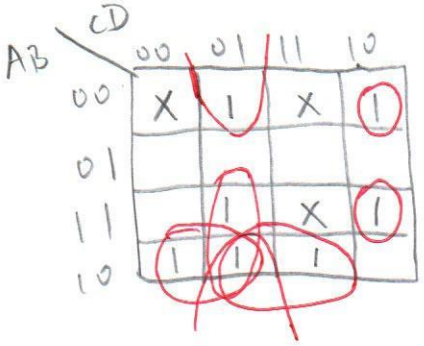
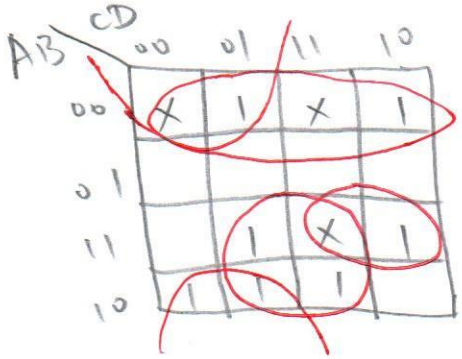
EE115B, Fall 2024, Homework 2
Solution

1. (1) SOP : without don't cares



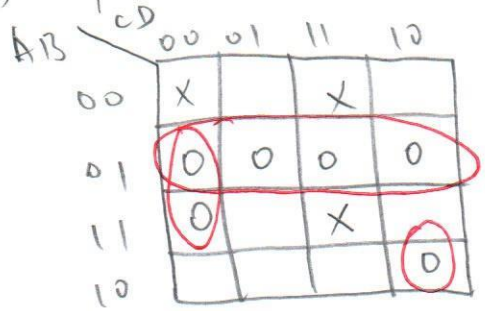
$$Y = A\bar{B}\bar{C} + A\bar{B}D + A\bar{C}D + \bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + AB\bar{C}\bar{D}$$

(2) SOP : with don't cares



$$Y = \bar{A}\bar{B} + \bar{B}\bar{C} + AD + ABC$$

(3) POS : without don't cares



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

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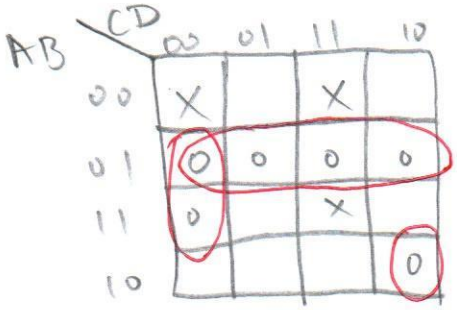
(4) POS: with don't cares



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

Note: (4) & (3) result in the same POS (i.e., don't cares are not contributing).

2. (1) Minterms

1	2	8	9	11	13	14
0001	0010	1000	1001	1011	1101	1110

Grouping & combining

group 1
1 0001 ✓
2 0010
8 1000 ✓

group 2
9 1001 ✓
11 1011 ✓

group 3
13 1101 ✓
14 1110

group 1
1, 9 −001
8, 9 100−

group 2
9, 11 10−1
9, 13 1−01

terminated

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PIs:

2	0010	$\bar{A}\bar{B}C\bar{D}$
14	1110	$ABC\bar{D}$
1,9	-001	$\bar{B}\bar{C}D$
8,9	100-	$A\bar{B}\bar{C}$
9,11	10-1	$A\bar{B}D$
9,13	1-01	$A\bar{C}D$

(2) PI chart

minterms	PI	1	2	8	9	11	13	14
2	$\bar{A}\bar{B}C\bar{D}$		(X)					
14	$ABC\bar{D}$							(X)
1,9	$\bar{B}\bar{C}D$	(X)			X			
8,9	$A\bar{B}\bar{C}$			(X)	X			
9,11	$A\bar{B}D$				X	(X)		
9,13	$A\bar{C}D$				X		(X)	

All PIs are $\bar{E}$PIs:

$$Y = \underbrace{\bar{A}\bar{B}C\bar{D} + ABC\bar{D} + \bar{B}\bar{C}D + A\bar{B}\bar{C} + A\bar{B}D + A\bar{C}D}_{\text{EPIs}}$$

Note: same result as in 1(1).