

Assignment 9

Question 1

Let $Q = X$

$$X(a,b,c,d) = (\neg a \wedge \neg b \wedge \neg c) \vee (\neg b \wedge c \wedge \neg d) \vee (\neg a \wedge b \wedge c \wedge \neg d) \vee (a \wedge \neg b \wedge \neg c)$$

	pattern	Minterms	Pattern
① m_1	0 0 0 - ✓	m_1, m_3	- 0 0 -
m_2	- 0 1 0 ✓	m_2	- 0 1 0
② m_3	1 0 0 - ✓	m_1, m_3	,
③ m_4	0 1 1 0 ✓	m_4	0 1 1 0

Prime Implicants:

m_1, m_3, m_2, m_4

	m_1	m_2	m_3	m_4
✓ m_1, m_3	✓		✓	
✓ m_2		✓		
✓ m_4				✓

Essential prime implicants : m_1, m_3, m_2, m_4

$$X(a,b,c,d) = (\neg B \wedge \neg C) \vee (\neg B \wedge C \wedge \neg D) \vee (\neg A \wedge B \wedge C \wedge \neg D)$$

Total operations : 8

initial operations : 12

Question 2

two Complement

Checking

	b_2	b_1	b_0	O_2	O_1	O_0
m_0	0	0	0	0	0	0
m_1	0	0	1	1	1	1
m_2	0	1	0	1	1	0
m_3	0	1	1	1	0	1
m_4	1	0	0	1	0	0
m_5	1	0	1	0	1	1
m_6	1	1	0	0	1	0
m_7	1	1	1	0	0	1

m_3 $\frac{011}{100}$ $\frac{101}{1}$	m_4 $\frac{100}{011}$ $\frac{100}{1}$	m_5 $\frac{101}{010}$ $\frac{011}{1}$
m_6 $\frac{110}{001}$ $\frac{010}{1}$	m_7 $\frac{111}{000}$ $\frac{100}{1}$	

Question 3

EV

$(a \wedge b \wedge c \wedge d) \vee (a \wedge b \wedge c \wedge \neg d) \vee (\neg a \wedge b \wedge c \wedge d) = (b \wedge c \wedge d)$

Total operators : 8
Initial operators : 15

~~type eval = Interpretation \rightarrow BExp \rightarrow Bool~~
~~eval _ F = False~~
~~eval _ T = True~~
~~eval i (Var x) = i x~~

type eval = Interpretation \rightarrow BExp \rightarrow Bool
 eval _ F = False
 eval _ T = True
 eval i (Var x) = i x
 eval i (Not e) = not (eval i e)
 eval i (e1 \wedge e2) = eval i e1 && eval i e2
 eval i (e1 \vee e2) = eval i e1 || eval i e2