Hwk 2 EECE622

Winter 2012

(I) Prove the following identities (using truth tables).

A AND 0 = 0

A + 1 = 1

A + (A AND B) = A

A + ((~A) AND B) = A + B

~ is the NOT OPERATION

(II) Using the following table

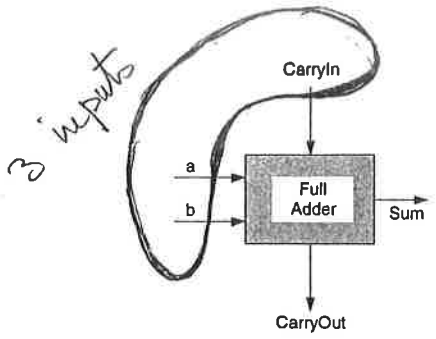
AB	f0	f1	f2	f3	f4	f5	f6	f7	f8	f9	fa	fb	fc	fd	fe	ff
00	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
01	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
10	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
11	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1

Show $f9 = (\sim A)(\sim B) + AB$

$f6 = A(\sim B) + (\sim A)B$

$f2 = A(\sim B)$

(III) Using the truth table of the full adder below



a	b	$CarryIn$	Sum	$CarryOut$
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Show

$$Sum = \bar{a}\bar{b}CarryIn + \bar{a}b\overline{CarryIn} + a\bar{b}\overline{CarryIn} + abCarryIn$$

$$CarryOut = \bar{a}bCarryIn + a\bar{b}CarryIn + ab\overline{CarryIn} + abCarryIn$$

By manipulation of the last Boolean expression, show that

$$CarryOut = ab + aCarryIn + bCarryIn.$$

(IV) Show how to use the QCA described in class to implement an AND gate starting with the majority voting logic architecture discussed in class.