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Digital Circuits Assignment 1 Solutions for Question 1

S1.i)

A: 0111 1011

B: 1000 -> extension to obtain 8 bit -> 0000 1000

As they are unsigned, A=|A| and B=|B|.

B’s 2’s complement is: 0000 1000 -> 1111 0111+1= 1111 1000

A: 0111 1011 A: 0111 1011

+B: 0000 1000 + (-B): 1111 1000

1000 0011 10111 0011

(No carry, carry=0) (Carry=1)

S1.ii)

A: 0111 1011

B: 1000 -> sign extension to obtain 8 bit -> 1111 1000

A is positive, B is negative. To obtain B’s absolute value, we apply 2’s complement operations: 1111 1000 -> 0000 0111+1= 0000 1000

A: 0111 1011 A: 0111 1011

+B: 1111 1000 + (-B): 0000 1000

10111 0011 1000 0011

(overflow occurs, (overflow occurs,

9th bit is 1, ignored) bc of the “pos-neg=neg”,

9th bit is 0, ignored)

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Digital Circuits Assignment 1 Solutions for Question 2

S2.i)

[a ⨁ b ⨁ c ] + a’bc+ab’c

Definition of XOR

[(a’b+ab’) ⨁ c] + a’bc+ab’c

Consensus theorem with respect to a (for both)

[0 ⨁ c] + bb’cc

Definition of XOR and axioms

[0’c+c’0]+0

RESULT: c

S2.ii)

abc’d+a’bc’d+ab’d+a’b’d+b’cd’

(a+a’)bc’d+(a+a’)b’d+b’cd’ according to axioms, a+a’=1

bc’d+b’d+b’cd’

consenus theorem with respect to b

c’dcd’+b’d

0+b’d axioms are used

RESULT: b’d