Name: KEY **Id#**

COE 202, Term 131
Digital Logic Design

Quiz# 4

Date: Tuesday, Nov. 25

Q1. Design a circuit that accepts two 2-bit unsigned numbers A = A_1A_0 and B = B_1B_0. The circuit produces A – B when A > B, and produces A + B otherwise. Find the following:

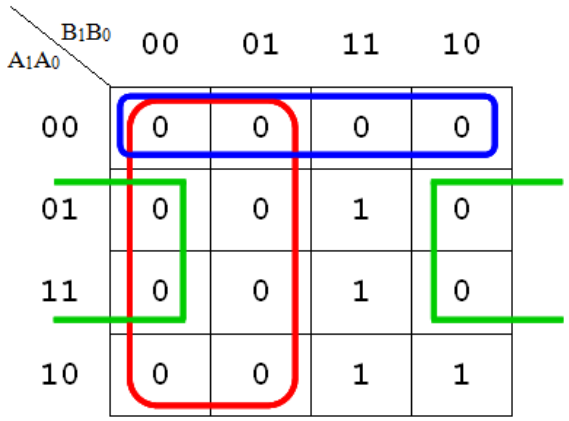
(a) The number of outputs produced by the circuit.

$A - B$ result is at most 2 bits, $A + B$ result is at most 3 bits $\Rightarrow$ **# outputs = 3**

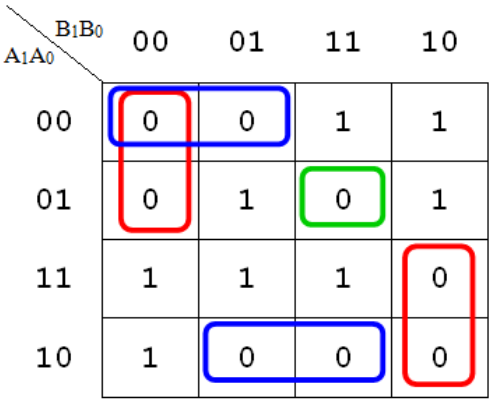
(b) The truth table of the circuit.

A_1	A_0	B_1	B_0	O_2	O_1	O_0
0	0	0	0	0	0	0
0	0	0	1	0	0	1
0	0	1	0	0	1	0
0	0	1	1	0	1	1
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	0	1	1
0	1	1	1	1	0	0
1	0	0	0	0	1	0
1	0	0	1	0	0	1
1	0	1	0	1	0	0
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	0	1	0	1	0
1	1	1	0	0	0	1
1	1	1	1	1	1	0

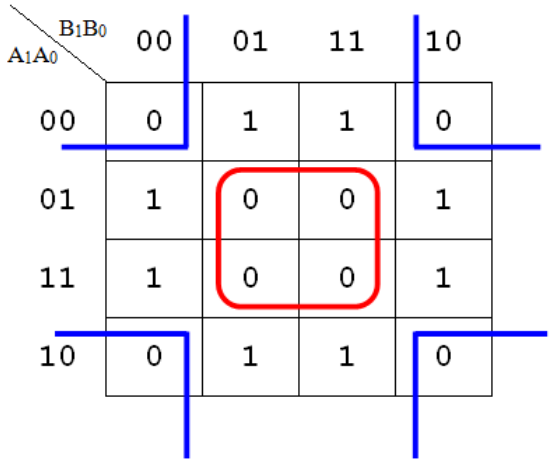
(c) The minimal product-of-sums expression for each output.



$$O_2 = (A_1 + A_0)(\overline{A_0} + B_0)B_1$$



$$O_1 = (A_1 + A_0 + B_1)(A_1 + B_1 + B_0)(\overline{A_1} + A_0 + \overline{B_0})(\overline{A_1} + \overline{B_1} + B_0)(A_1 + \overline{A_0} + \overline{B_1} + \overline{B_0})$$



$$O_0 = (A_0 + B_0)(\overline{A_0} + \overline{B_0})$$

Q2. Convert the AND/OR/NOT logic diagram shown below to a NAND logic diagram: