Lab04 Report

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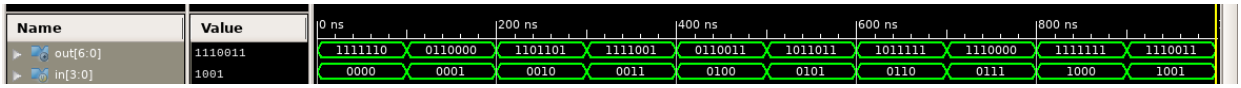
1. Lab: BCD to 7-segment decoder

[1] Structural description

Simulation result:



We can check that each input combination gives the expected output combination.

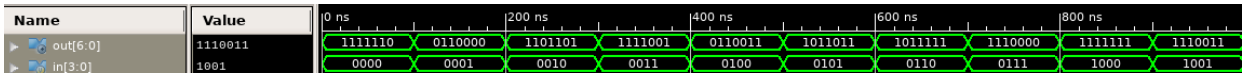
[2] Data-flow description

Simulation result:

The result is the same as [1], which is the desired result.

[3] Behavioral description

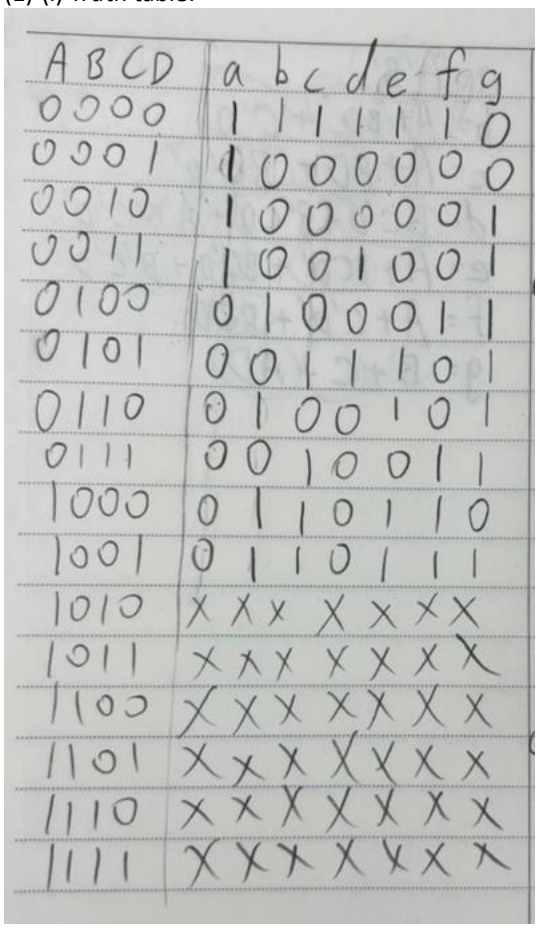
Simulation result:



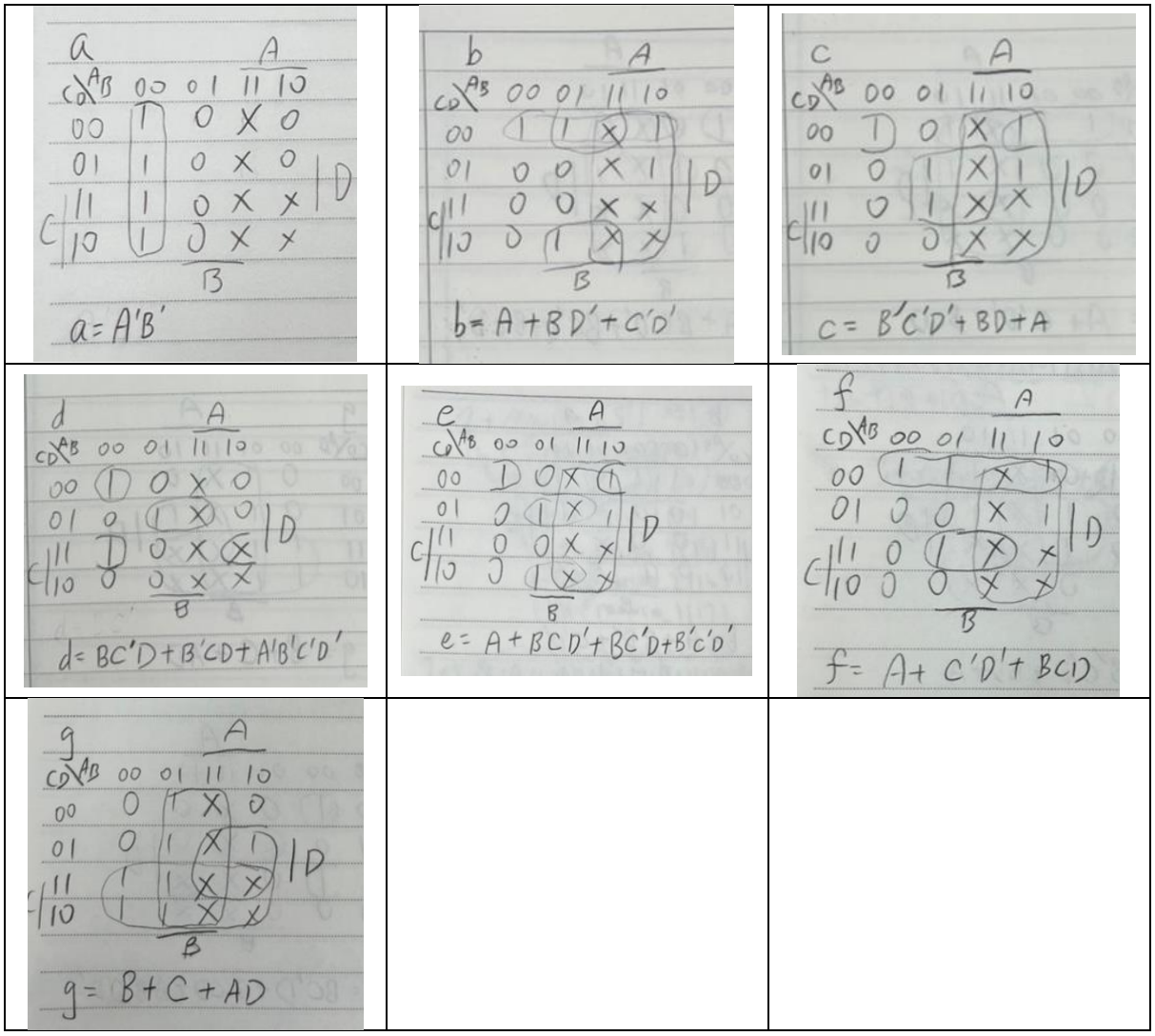
The result is the same as [1], which is the desired result.

2. Homework: Klingon number system decoder

(1)-(i) Truth table:



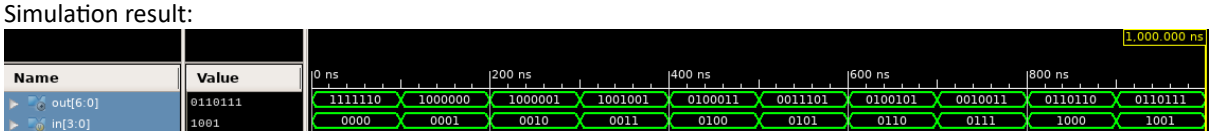
(1)-(ii) Karnaugh map



(1)-(iii) Boolean expressions
a = A'B'
b = A + BD'+ C'D'
c = A + BD + B'C'D'
d = BC'D + B'CD + A'B'C'D'
e = A + BCD' + BC'D + B'C'D'
f = A + C'D' + BCD
g = B + C + AD

(2) Source code
For each description, inputs A, B, C and D are represented by a single array in[3:0], and the outputs a, b, c, d, e, f and g are represented by a single array out[6:0].

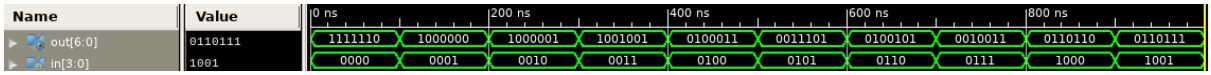
(3) Simulation result
[1] Structural description
Simulation result:



We can check that each input combination gives the expected output combination, matching the truth table.

[2] Data-flow description

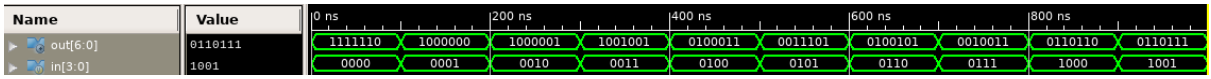
Simulation result:



The result is the same as [1], which is the desired result.

[3] Behavioral description

Simulation result:



The result is the same as [1], which is the desired result.

(3) Discussion

The readability of the simulation result increased compared to the previous lab session, by using arrays for inputs and outputs respectively. It was significantly easier to check the output was correct, because this made it easier to compare the simluation result with the truth table. Moreover, the implementation of the test code was made simpler than the previous lab session, with the use of for loops. I no longer needed to write one line of code for every input combination, which saved a lot of time.