**MATH 1310** – Technical Mathematics for IT

**Assignment 6**

**Due: start of the class, week of November 14-18**

This is how I mark this assignment:

50 percent: I scan all the questions to see if they are solved or not. 50 percent: I select a few parts randomly and mark them in detail.

**Problem 1:** For the following digital circuit:

Diagram, schematic

Description automatically generated

1. [4 marks] Write out the formula for Q in terms of a, b, c, and d as implemented in this circuit. Do not do any simplification. **As part of your work, label each line in the diagram above with the corresponding logical expression**.
2. Text

   Description automatically generated[6 marks] Use the formula for Q from part (a) to sketch the Karnaugh map for Q.Analyze this Karnaugh map to obtain the optimal formula for Q that will allow you to construct the optimal circuit for Q using NOR gates only.

**Problem 2:** This question asks you to develop a digital circuit which accepts four inputs a0, a1, a2, and a3 which form the four binary digits of a 4-bit bias-7 representation of values between -7 and +7 in the form a3a2a1a0. (That is, a0 is the ones digit, a1 is the twos digit, a2 is the fours digit, and a3 is the eights digit.) In the end, you will sketch a digital circuit which has four outputs, b0, b1, b2, and b3 which are to be the four digits of the signed magnitude representation of the input bias-7 value, in the form b3b2b1b0. (That is, b0 is the ones digit, b1 is the twos, b2 is the fours, and b3 is the sign bit.)

1. Table

   Description automatically generated[4 marks] Complete the following truth table for this problem:
2. [8 marks] On separate sheets, develop simplest SOP formulas for each of b3, b2, b1, and b0.

Diagram, schematic

Description automatically generatedConvert each of those formulas to NAND-gate only formulas.

Text, letter

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1. Diagram, schematic

   Description automatically generated[4 marks] Complete the following sketch so that it displays outputs for each of b3, b2, b1, and b0.