A6 (30 marks)

Q1. For the shown logic circuit: (12 marks)

    i.   Write the Boolean function f.

    ii.   Draw the truth table for f.

    iii.   Simplify f using Karnaugh maps and redraw the simplified circuit.

    iv.   Which circuit is better (original or simplified)? Why?
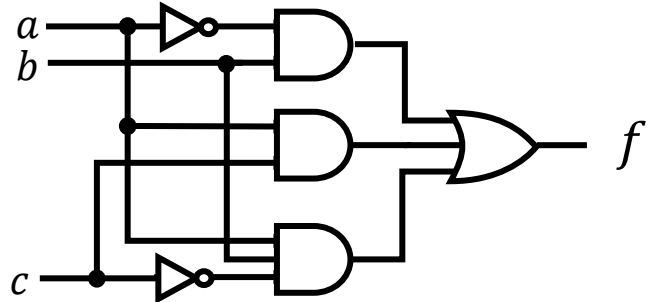

Q2. Consider the function $f = a \cdot b + \overline{a \cdot c} \cdot \overline{b}$ (8 marks)

    i.   Draw a combinational logic circuit that implements the function f.
    ii.   Draw a truth table for the function f.
    iii.   Write a sum-of-products representation of f.

Q3. Design combinational logic circuit that generates the 2's complement of a 4-bit input binary number. Do the following: first, draw a truth-table with 4 inputs: a, b, c, and d, and four outputs: w, x, y, and z. Second, fill in the standard input values and find the output number (wxyz) which represents the 2's complement of the input (abcd). Finally, find the logic equation for each output w,x,y, and z using K-maps. You don't need to draw the logic circuits for the outputs.   (10 marks)

    For simplicity, assume that when abcd=1000, then wxyz will also be = 1000
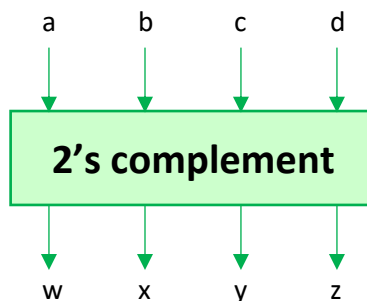
Submission Instructions:

This is **a written assignment**. Solve it **on paper, scan it**, and then submit it to **Canvas** before the deadline (check the syllabus for the deadline). Type your answers or write clearly in legible handwriting. Answers that are impossible to read will be deducted marks. You can also solve it on the computer, but this will take much more time thank hand-writing it.