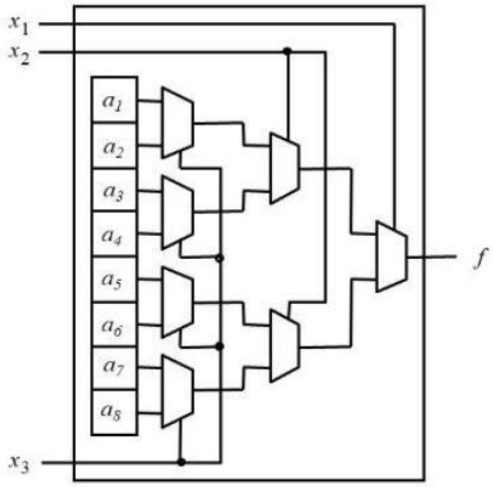
CS 516000 FPGA Architecture & CAD

Homework 1 (Due: 2024/09/23)

1. A SRAM-based 3-input LUT is shown below. How could we implement each of the following functions using a SRAM-based 3-input LUT? (Write down the configuration of $(x_1 \sim x_3)$ and $(a_1 \sim a_8)$)

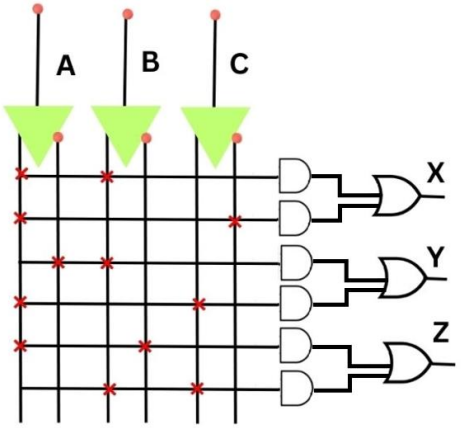
   (i) $f_1 = (\bar{c} + ab)\overline{(a + c)}$

   (ii) $f_2 = ad + \bar{a}$



2. (a) How many 2-to-1 multiplexers are there in a k-input LUT?
   (b) How many different functions can be implemented by a k-input LUT?

3. Please write down the output functions (X, Y, Z) for the following PAL circuit.



4. Though not reprogrammable, Antifuse FPGAs still have their place in the FPGA market. What are the advantages of Antifuse FPGAs that SRAM-based FPGAs don't have? (List at least 2 of them)

5. Prove that any function that has less than or equal to 6 variables can be implemented using the logic block shown below.