

Computer Organization and Structure

Homework #1
Due: 2008/10/7

1. Given the following three functions:
 - a. A two-bit-wide *shifter* takes two input signals, i_0 and i_1 , and shifts them to two outputs, o_0 and o_1 , under the control of a shift signal. If this signal SHIFT is false, then the inputs are connected straight through to the outputs. If SHIFT is true, then i_0 is routed to o_1 and o_0 should be set to a 0.
 - b. A two-bit *demultiplexer* takes an input signal IN and shifts it to one of two outputs, o_0 and o_1 , under the control of a single SELECT signal. If SELECT is 0, then IN is connected through to o_0 and o_1 is connected to a 0. If SELECT is 1, then IN is connected through to o_1 and o_0 is connected to a 0.
 - c. A two-bit *multiplexer* takes two input signals, i_0 and i_1 , and shifts one of them to the single output OUT under the control of a one-bit SELECT signal. If the SELECT signal is false, then i_0 is passed to OUT. If SELECT is true, then i_1 is passed to OUT.
 - d. A four-input function that outputs a 1 whenever an odd number of its inputs are 1.

Complete the following four items:

- a. Construct their truth tables.
- b. What are the functions in sum of products forms, using “little m ” notation?
- c. Use the Karnaugh map method to simplify the functions in sum of products forms.
- d. Draw logic schematics using AND, OR, and INVERT gates.