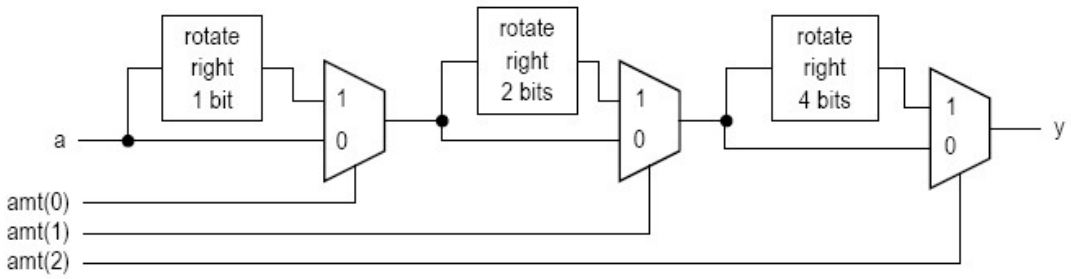
ECE420
Spring 2021
California State University, Northridge
Department of Electrical and Computer Engineering
Computer Assignment 2
Design of a Combinational Barrel Shifter/Rotator

The following figure shows the block diagram of an 8 bit rotator. The 3 bit amt(2:0) specify the number of bits input a is rotated. For instance amt(2:0) = 101 rotates a bit for 5 bits. If this rotation amount is applied to a = 1011 0101, the result would be 1010 1101. The first multiplexer rotates input a for one bit, the second multiplexer rotates the output of the first multiplexer for 2 bits, and the third multiplexer rotates the output of the second multiplexer for 4 bits. A rotation amount of any number from 0 to 7 bits can be created by combining the smaller rotations of 1, 2, and 4.



1. Expand the idea presented by this block diagram to design a 16 bit rotator and draw the block diagram.
2. Design a 2x1 multiplexer using simple gates.
3. Instantiate the multiplexer in the top level design as many times as necessary to design a combinational rotator of length 16 bits.
4. Simulate your design for the correct functionality. Write testbenches for 2x1 multiplexer as well as 16 bit combinational rotator.

Note: The input signal must be defined as a 16 bit vector. This means each stage of the multiplexer includes 16 2x1 multiplexer.

GOOD LUCK!