CSCI 2500: Computer Organization

Lab 8 – Introduction to Digital Logic

For this assignment you will finish a C program to simulate gates, an S-R latch, decoder, and multiplexer. This assignment is designed to reinforce several concepts:

- Learn how to simulate digital logic with C functions
- Increase your understanding of the circuits covered thus far
- Learn about unit testing

The file lab_8.c (download from LMS; Labs → Lab 8 (10/28/2015)) already contains declarations, a few sample implementations. Each function represents a gate or circuit that needs to be implemented. You are to complete the following functions:

```
BIT and_gate(BIT X, BIT Y) /* AND gate */
BIT xor_gate(BIT X, BIT Y) /* XOR gate */
BIT multiplexer(BIT I0, BIT I1, BIT I2, BIT I3, BIT S0, BIT S1) /* 4-Input MUX */
void decoder(BIT I0, BIT I1, BIT O0, BIT O1, BIT O2, BIT O3) /* 2-Input Decoder */
BIT sr_latch(BIT S, BIT R, BIT Q) /* S-R Latch */
```

Part of this assignment is to make sure that each test is exhaustive for the gate or circuit being tested, i.e. all combinations of inputs should be tested. The `main` function contains units tests for most of the functions. You must implement the unit tests for the last two functions: the 2-Input Decoder and the S-R Latch emulation routines). You will need to determine what the correct output should be for each case and encode that in your unit test cases.