Digital Logic Design Lab #1

Objectives

Understanding of instrumentation and basic logic system definitions.

Material

1) Textbook: Digital Logic Design
2) Course Website: www.EngrCS.com
3) Instruments: Power Supply, Function Generator and Oscilloscope
4) Supplies:
   * Proto Board
   * Jumper Wire

Experiment 1.

Based on in-class presentation covering power supply, oscilloscope and function generator instruments, complete the following three steps:

1) Identify & document controls for the Power Supply and draw a diagram of a usage example.

2) Identify & document controls for the Multimeter and draw a diagram of a usage example. Ensure that your controls include:
   a. Resistance, Voltage, Current Measurements
   b. Range control

3) Identify & document controls for the Function Generator and draw a diagram of a usage example. Ensure that your controls include:
   a. Frequency control
   b. Amplitude control
   c. DC bias/offset control

4) Identify & document controls for the Oscilloscope and draw a diagram of a single channel usage example. Ensure that your controls include:
   a. Channel One Vertical control
   b. Time domain Control
   c. Screen layout and screen grid definition
   d. Channel Selector

   Note: TDS 1000 Series manual is available on the course website.

Experiment 2.

Set the Function Generator to Square wave with frequency of 1 KHz, 50% duty cycle, amplitude to 5 V peak-to-peak and DC Bias of 2.5 V. Set the Oscilloscope time division such that you are able to view one whole cycle. Sketch the Wave form on the Oscilloscope and describe variation from ideal square wave.

Notes:

* *DC Bias or DC offset refers to DC voltages added to the AC signal.*
* Duty Cycle refers to the percent of cycle time that the square wave signal is not zero.

Experiment 3.

Repeat the Experiment 2 at 10 Hz.

Experiment 4.

Repeat the Experiment 2 at the Function Generator's Maximum frequency.

Experiment 5.
Map the proto-board connectivity.

Experiment 6.
A three way intersection needs a traffic signal control system. Each direction has only one lane and one signal control light (green and red) each Lane. Identify the Input variables into the traffic control system and Output variables to control the signals. Sketch the intersection with identified variables and their values. Also Develop a Truth Table for the Signal Control System at this intersection.

The traffic light system should adhere to the right-of-way laws of the state of Washington for a 3-way intersection.

Report Requirements
All reports must be computer printed (Formulas and Diagrams may be hand drawn) and at minimum include:

For each Experiment

a) Clear problem statement; specify items given and to be found.
b) Identify the theory or process used.
c) Documents resulting Circuit design, tables, timing diagram, schematic and other results.

For the report as a whole

a) Cover sheet with your name, course, lab, date of completion and team members' names.
b) Lessons Learned from the experiments.
c) A new experiment and expected results which provide additional opportunity to practice the concepts in this lab.