Physics 145: Labview

What's the point?: The Labview software package is a graphical programming tool for computer-assisted instrument control, data acquisition, and data analysis. After a brief introduction to basic Labview concepts, you will create a data acquisition VI and use it to measure the angular velocity of a spinning motor axel.

Equipment: Computer equipped with a DAQ card and interface box, mass-spring pendulum, force transducer, Getting Started with Labview manual, DC motor with power supply, laser and photodiode, rods and clamps.

Introduction: Automated experimentation and data acquisition constitute a very valuable skill set that can be applied in almost any research setting. Labview provides a graphical programming (i.e. data-flow programming) environment for such work. With that said, the best way to understand what this means is to simply dive in. Have your TA initial the sheet below to indicate completion and tape it into your lab notebook. No formal lab report is required.

Procedure:

A. **Complete all of the exercises** in the *Getting Started with Labview* manual up through 4-4.

B. Measure the rotation frequency of a DC motor axel vs. applied DC voltage. Configure the laser and photodiode so that a piece of tape attached to the motor axle breaks the beam on each rotation. Use the data acquisition VI that you created at the end of part A to read the photodiode voltage into Labview. Sample it rapidly so as to clearly see the time dependence of the rotor position, send the results to a waveform graph, and use the graph cursor tools to obtain an accurate measure of the rotation period. Increment the motor voltage in 1 V steps, record the results in a Microsoft Excel spreadsheet, and plot rotor speed (Hz) as a function of potential difference (Volts). **Do not attempt to supply more than 20 V to the motor!**

Tips for Chapter 4-4 exercises:

1) A graph is added to the VI for the purpose of visualizing the data being read in. Right click the graph on the Front Panel to see the graph options. Let the Visible Items include the Cursor Palette and the Graph Palette. Become familiar with these tools and use them to accurately measure the pendulum period. You will also find it helpful to turn off the Y Autoscaling, after which you can manually set the new limits by using the text tool to change the top and bottom scale values right on the graph itself.
2) Use a force transducer as the input signal for testing your data-acquisition VI. Hang a mass spring pendulum from the force transducer and set the transducer to its 10 Newton scale. The transducer has two plug adaptors that connect to the computer interface box located on the shelf below your computer, one plug for power (choose any of four power jacks on the interface box) and one plug for analog input (channel 1 on the interface box works with Labview channel ai0). Check to see that the red power light on the interface box is on. Inside the DAQ Assistant, increase the number of samples in order to obtain a measurement time that includes about three oscillation periods.
3) Wire numeric controls to the Rate and Number of Samples inputs of the DAQ assistant so that you can more easily experiment with these values. You are also encouraged to experiment with the Custom Scaling feature of the DAQ Assistant and to use it to center the transducer output on 0 V.

Name:_____

Cut this section out and paste in lab notebook.
TA initials indicate completed work.

Chapter 1 (2 points) _____
Chapter 2 (2 points) _____
Chapter 3 (2 points) _____
Chapter 4 (2 points) _____
Axel Speed Experiment (2 points) _____