Basic Experiments

1 Experiment 1

Aim The goal of this experiment is to give a recap of labview, and various signal manipulations that may be required in different experiments. Please perform the various tasks that are indicated below so as to get sufficient familiarity with labview.

Tasks

1. Launch Labview from the *Start* → *Programs* menu. Programs under labview are called "vi"s, short for *virtual instrument*s.
2. Two windows would pop-up, one with grid lines and one blank. The blank one is the window where you develop the function of the "instrument", while the one with grid lines is the "output window" where you have the display units and manual inputs - in other words, the "face" of the instrument. Right clicking in any of these windows brings up a menu showing the various blocks that one can put in these windows. Creating an instance of any block in labview display, also places a coresponding icon in the program window for provding the connections.
3. Place a signal source to generate a sine wave of 50 Hz and 10 V amplitude and display it in a graph.
4. Find the rms value of the waveform (use a suitable block) and display it in an indicator.
5. Scale the output of the signal source by a factor of two and display it in a separate graph.
6. Reduce the amplitude of the sine wave to 2 V and add an offset of 150 V. Plot the resulting signal. Use a suitable block to find the average of the resuting signal and display it on an indicator.
7. Generate two signals one of 10 units amplitude and another of 2 units amplitude, both in phase with each other. Imagine that they are voltage and current signals across an element. By multiplying the two, find the average power consumed in the element. Repeat the experiment if the current signal is lagging the voltage by 30°.

8. Generate three signal representing voltages of a balanced three phase system, and three signals representing currents at a power factor of 0.6 lag. Find the power transmitted. Display all voltage waveforms in one graph, currents in another and power as an indicator.

2 Experiment 2

Aim The goal of this experiment is to gain familiarity with the operation of the Data Acquisition (DAQ) card NI-USB 6215, and making measurements using that. Please perform the various tasks that are indicated below so as to get sufficient familiarity with this.

Tasks

1. The DAQ card can be accessed by using the DAQ Assistant found in the program window menus. Plaing this icon in the window will cause Labview to scan and locate the right card. The DAQ card has been connected for single-ended operation mode where it can acquire 16 signals, all having a common ground.

2. Connect the ac supply available on the bench (include the variable-output transformer in circuit) to the load box. Use a voltage transducer, say VS1, to measure the voltage given to the load and a current transducer, say CS1, to measure the current through the load. *Remember that current transducer connection is a series connection* while voltage transducer is connected *across* the points where you want to measure the potential difference. The BNC connector under each sensor provides the waveform of the signal measured and it must be connected to the proper BNC terminal at the input to the DAQ card.

3. Configure the DAQ for voltage measurements (even though you are measuring current in one channel, it is being converted to a scaled voltage value for DAQ measurement) at the appropriate channels. Develop the program to measure these signals and display the waveforms on actual scale. The sensors provide an attenuation of 80 for voltage measurments and 2.5 for current measurements. Use appropriate blocks to indicate their rms values.

4. The DAQ signal acquisition may be set to continuous mode or N samples mode put in a while loop.

5. Once the connections have been verified, switch on power to the variable-output transformer. Adjust the transformer to get full voltage (check the values dis-

played by Labview) of 230 V ac. The current reading should show very small values at this time.

6. Increase the load in stages through the load switch. Watch the current and voltage waveforms.

7. Develop suitable block structures to measure the active power (real power) at the load. *Hint*: This power is the average value of the instantaneous power $v(t)i(t)$.

3 Experiment 3

Aim The goal of this experiment is to learn to capture readings from Labview automatically to a file for further computation and to acquire continuous sampled data.

Frequently it is necessary to store values read during an experiment. For example one may need to vary the applied voltage in steps and for, say ten values of the voltage, note down certain other parameters. Let us say we want to check the linearity of the load resistor. You would need to vary the voltage from 0 to 200 V in steps of 25 V, and note down the current in each step. All measurements are to be done in Labview.

For this, one would first need to run an instrument (virtual) to display the readings of voltage and current as you adjust the voltage. This has already been done in the previous experiment. With this program, say vi-A, kept minimized do the following.

Tasks

1. Extend the capability of vi-A to write to a file in a new program, say vi-B. In vi-B set the DAQ to acquire N samples. The number of samples and sampling frequency should be such that with N samples, an integral number of cycles are covered. When run, this vi will capture N samples, so the computations and stop. Set the output file to append mode since we need several readings.

2. Use the write to lvm file block and set the output to test.lvm in the directory d:labclass.

3. Now run vi-B and take one reading at 0 V.

4. Now run vi-A and adjust the voltage to 25 V. Stop vi-A.

5. Now run vi-B to capture the readings and send it to the file.

6. Now run vi-A again to adjust the voltage to 50 V. Stop vi-A.
7. In this manner, run vi-B and vi-A one at a time to adjust and capture readings.
8. Close the "vi"s. Open the file test.lvm and copy the data to an excel sheet. Plot the voltage vs current. Check if the plot is linear.

4 Experiment 4

Aim The aim of this experiment is to determine the frequency of the given power supply.

Background

The frequency measurement is conducted to determine the frequency of the given power supply. This experiment is important as the value of the frequency is used in the experiments of open circuit test of induction motor and synchronization of alternator with grid. The value of the frequency has to be determined at the time of these experiments as the supply frequency varies from time to time.

Procedure

The experiment on frequency measurement is done by plotting the supply voltage in LabVIEW. Then, note down the value of the time period of the voltage wave form.

Calculations

The value of the frequency can be determined from the time period of the voltage wave form plotted in LabVIEW.

5 Experiment 5

Aim The aim of this experiment is to determine power delivered to a 1 - Φ and 3 - Φ Resistive load.

Background The experiment on power measurement is to determine the power delivered to a 1 - Φ and 3 - Φ Resistive load.

Procedure

1 - Φ Power Measurement

The experiment is started by first setting up the LabVIEW model. The circuit connection is to be made as shown in Fig.1. Once the connections have been checked, apply the 1 - Φ voltage. Note down the values of voltage, current and power for different load by varying the load present in the panel(From position zero to Five). Tabulate the values in the table as shown in Table.1.

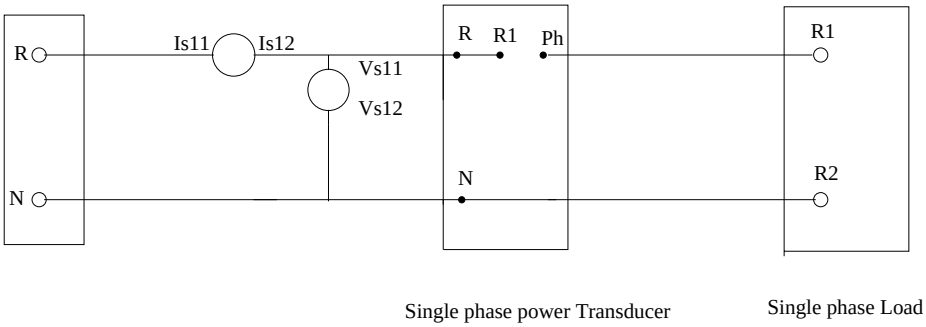

Figure 1: Measurement of single phase power

S.No.	Voltage (V) (Meter no.)	Current (A) (Meter no.)	Power (W)

Table 1: 1 - Φ Power Measurement

Measurement of 3 - Φ Measurement

The experiment is started by first setting up the LabVIEW model. The circuit connection is to be made as shown in Fig.2. Once the connections have been checked,

apply the 3 - Φ voltage. Note down the values of voltage, current and power for different load by varying the 3 - Φ load . Tabulate the values in the table as shown in Table.2.

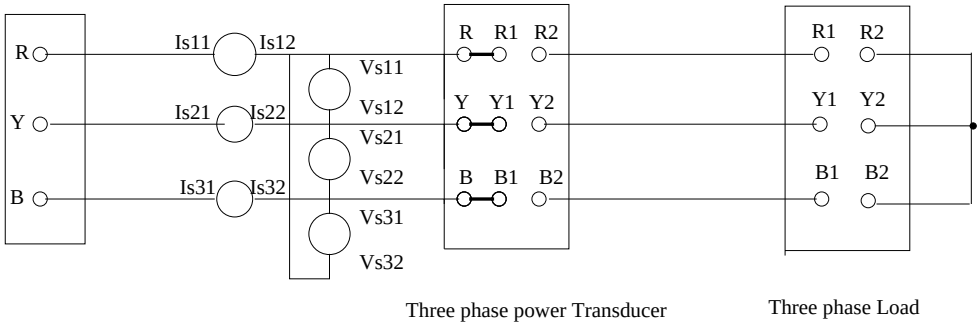

Figure 2: Measurement of three phase power

S.No.	Voltage (V) (Meter no.)	Current (A) (Meter no.)	Power (W)

Table 2: 3 - Φ Power Measurement

Calculations

Cross check the values of power calculated from voltage and current with the power readings.