**CIRCUIT AND SYSTEM - II LAB**

**Fall 2022**



Submitted to**: Mr. Faiz Ullah**

Submitted by: **Muhsin Shah**

Registration **# 21PWCSE2018**

Semester # **03**

Section: **B**

“On my honour, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work.”

Student Signature: Muhsin shah….

Department of Computer Systems Engineering

University of Engineering and Technology, Peshawar

# **Lab Experiment # 01**

# Title:

# **The Oscilloscope**

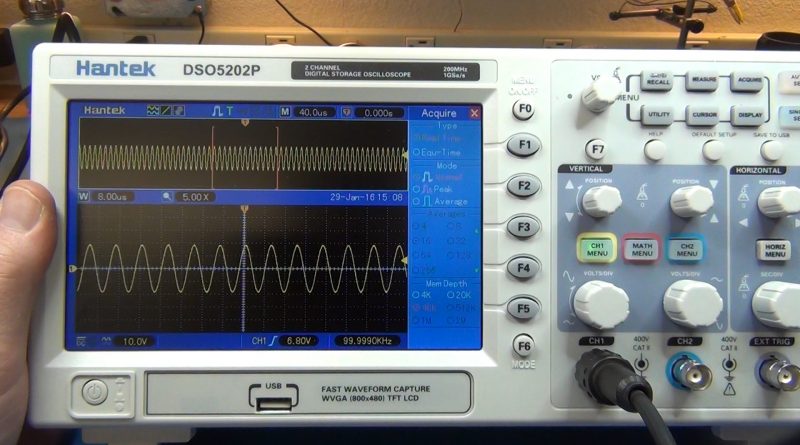
# Objectives:

Objectives of this lab are;

* This exercise is of a particularly practical nature, namely, introducing the use of the oscilloscope.
* The various input scaling, coupling, and triggering settings are examined along with a few specialty features.

# Oscilloscope:

An oscilloscope is a laboratory instrument commonly used to display and analyse the waveform of electronic signals. In effect, the device draws a graph of the instantaneous signal voltage as a function of time.



# Explanation:

The oscilloscope (or simply scope, for short) is arguably the single most useful piece of test equipment in an electronics laboratory. The primary purpose of the oscilloscope is to plot a voltage versus time, although it can also be used to plot one voltage versus another voltage, and in some cases, to plot voltage versus frequency. Oscilloscopes are capable of measuring both AC and DC waveforms, and unlike typical DMMs, can measure AC waveforms of very high frequency (typically 100 MHz or more versus an upper limit of around 1 kHz for a general purpose DMM). It is also worth noting that a DMM will measure the RMS value of an AC sinusoidal voltage, not its peak value.

While the modern digital oscilloscope on the surface appears much like its analogue ancestors, the internal circuitry is far more complicated and the instrument affords much greater flexibility in measurement. At a minimum, modern oscilloscopes offer two input measurement channels although four and eight channel instruments are increasing in popularity.

# Equipment:

Equipment used in this experiment are;

1. DC Power Supply
2. AC Function Generator
3. Digital Multi meter
4. Oscilloscope
5. 10 kΩ
6. 33 kΩ



# Procedure:

1. Find the following elements on your oscilloscope:

* Channel-1 and Channel-2 BNC input connectors.
* Trigger BNC input connector.
* Channel-1 and Channel-2 select buttons.
* Horizontal Sensitivity (or Scale) and Position knobs.
* Vertical Sensitivity (or Scale) and Position knobs.
* Trigger Level knob.

1. Note that the main display is similar to a sheet of graph paper. Each square will have an appropriate scaling factor or weighting. Waveform voltages and timings may be determined directly from the display by using these scales.
2. Select the channel-1 and 2 buttons. There should now be two horizontal lines on the display. They may be moved via the Position knob.
3. One of the more important fundamental settings on an oscilloscope is the Input Coupling. This is controlled via one of the bottom row buttons. There are three choices: Ground removes the input thus showing a zero reference, AC allows only AC signals through thus blocking DC, and DC allows all signals through (it does not prevent AC).
4. Set the channel-1 Vertical Scale to 5 volts per division. Set the channel-2 Scale to 2 volts per division. Set the Time (Horizontal) Scale to 1 millisecond per division. Finally, set the input coupling to Ground for both input channels and align the two lines to the center line of the display via the Vertical Position knob.
5. Build the circuit shown in the figure using E=10V, R1=10kΩ and R2= 33kΩ. Connect a probe from the channel-1 input to the power supply (tip to plus, black clip to ground). Connect a second probe from channel-2 to R2 (again, tip to the high side of the resistor and the black clip to ground).
6. Switch both inputs to DC coupling. The two lines should have deflected upward. Channel 1 should be raised two divisions (2 divisions at 5 volts per division yields the 10 volt source). Using this method, determine the voltage across R2 (remember, input-2 should have been set for 2 volts per division). Calculate the expected voltage across R2 using measured resistor values and compare the two in Table 1. Note that it is not possible to achieve extremely high precision using this method (e.g., four or more digits). Indeed, a DMM is often more useful for direct measurement of DC potentials. Double check the results using a DMM and the final column of Table 1.
7. Select AC Coupling for the two inputs. The flat DC lines should drop back to zero. This is because AC Coupling blocks DC. This will be useful for measuring the AC component of a combined AC/DC signal, such as might be seen in an audio amplifier. Set the input coupling for both channels back to DC.

# Data Tables:

**DC**

**For R1:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Scale(V/Div) | # 0f divisions | Peak to peak V |
| Oscilloscope | 1 | 3 | 3 |
| DMM | N/A | N/A | 3.09 |

**For R2:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Scale(V/Div) | # 0f divisions | Peak to peak V |
| Oscilloscope | 1 | 2 | 2 |
| DMM | N/A | N/A | 2.06 |

**AC**

**For R1:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Scale(V/Div) | # 0f divisions | Peak to peak V | Voltage RMS |
| Oscilloscope | 3 | 2 | 6 | 4.2 |
| DMM | N/A | N/A | N/A | 4 |

**For R2:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Scale(V/Div) | # 0f divisions | Peak to peak Voltage | Voltage RMS |
| Oscilloscope | 3 | 1 | 3 | 2.1 |
| DMM | N/A | N/A | N/A | 1.8 |

**For Frequency and Time period:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Scale(S/Div) | # of divisions | Frequency | Time Period |
| Oscilloscope | 50us | 3 | 0.006MHz or 6kHz | 150us |

# Conclusion:

 In this lab we used the oscilloscope to measure the current of several simple circuits. In the first part of the experiment we successfully completed our objective of this lab in learning the principles of operation and applications of the oscilloscope. In summary the oscilloscope is a powerful tool that allows you to see how voltage changes over time by displaying a waveform of electronic signals.