EXPERIMENT NO. 1

FAMILIARIZATION WITH LABORATORY EQUIPMENTS DIGITAL MULTIMETER, OSCILLOSCOPE, FUNCTION GENERATOR AND POWER SUPPLIES.

OBJECTIVE

- To study about Digital Multimeter.
- To study about Function Generator.
- To study about Dual Track Power Supplies.
- To study about Digital Oscilloscope and observe basic waveforms on CRO

EQUIPMENT REQUIRED

- Digital Multimeter
- Function Generator
- Bread Board
- Cathode Ray Oscilloscope

THEORY

In an Electronic Devices Lab, many instruments are required for measurement and taking results. Some more basic equipment is discussed here with brief introduction.

DIGITAL MULTIMETER

Digital Multimeter is a combination of Ammeter, Voltmeter, Ohmmeter and Continuity meter. Sometimes, there is also a terminal to check the transistor whether it is PNP or NPN. It is used for measurement of resistance, AC & DC voltage and current, continuity of a wire etc. It has separate AC and DC voltage and current ranges, resistance ranges, continuity, diode circuit. Some points should be kept in mind during measurements.

- Voltage should always be measured in *parallel*.
- Current should always be measured in *series*.
- Switch off circuit supply before measuring resistance of a resistor connected in circuit, and take out the resistor from circuit.

Dual Track Power Supply

The PMM Series is a multi-output, constant voltage regulated DC power supply with a dual-tracking function. Each model can vary (tracking) output 1 and output 2 simultaneously. It uses a series regulator system to generate stable outputs with low noise. It can be widely used as a power supply for testing transistor, IC circuit, LCD, and other devices.

Function Generator (Sg-2120)

Function Generator also called sine generator is used for making a sine wave, square wave and triangular wave. It is used in association with CRO. Signal from Function Generator is fed to the CRO, which analyzes the properties of the signal.

Types Of Signals

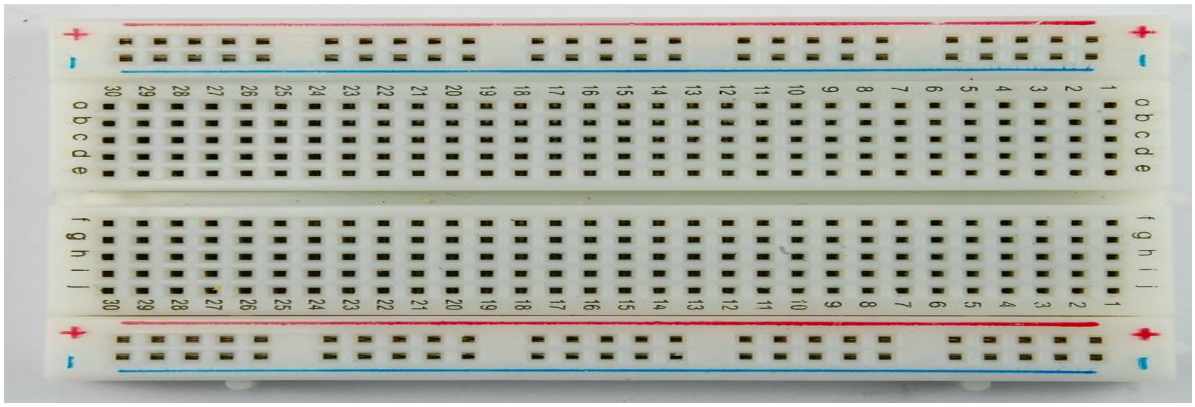
Following types of signal can be generated using function generator.

- Sine
- Square
- Triangular

In electronics, we mostly work with sinusoidal (sine) signals.

BREAD BOARD

Bread Board is an array of horizontal and vertical wires inside the body of the bread board, and upper side of it is perforated to insert wires in it. Bread board is used for checking circuit before printing it on PCB. It can also be used for making temporary circuit.



Digital Storage Oscilloscope, 25mhz, 250ms/S Utd 2025c

Digital storage oscilloscope with an extra-large display 2-chanel storage oscilloscope with outstanding performance data and an extra-large, backlit full colour displays.Designed for ease of use with very fast implementation of measurement input.Ideal for service work, training and quality assurance. In many applications, properties of voltage signal are very important to understand the operation of the circuit. In these situations, it is used which shows waveform of voltage with respect to time. A probe is used to connect the oscilloscope to the circuit. Oscilloscope indicates the potential difference between the two terminals of the probe. The terminal ending with a hook is usually connected to the node in the circuit whose voltage is our need. The other terminal is connected to the ground. The probes are attached to input channels **channel 1, channel 2** of the oscilloscope. Mostly oscilloscopes have two input channels and each channel can display a waveform on the screen with independent from other channel's signal. Both channels can be used to compare the waveform of two different voltages.

Its screen has two dimensional graph plotting ability. Vertical is for Voltage, and Horizontal is for Time.

- **Hs:**Horizontal Sensitivity shows Time/div. It shows the time period of a waveform to complete one cycle (one upper and one lower peak).
- **Vs:**Vertical Sensitivity shows V/div.
  It shows the peak to peak value of voltages of signal.

- **Intensity:**To adjust brightness
- **Focus:**To adjust sharpness

Normal Use OfCro

Auto_____ON

Vert Mode_____ ON

Ch2 Inv_____OFF

Xy_____OFF

×10mag_____OFF

Variable_____ Max. Clockwise

We can find the following factors using CRO.

- Amplitude
- Time period
- Frequency
- Phase difference

Duty Cycle

A *duty cycle* is the percentage of one period in which a signal or system is active. *Duty cycle* is commonly expressed as a percentage or a ratio. It is the percentage of one period in which a signal is active.

$$D = \frac{T}{P} \times 100\% \qquad 1.1$$

Where "D" is duty cycle.

PROCEDURE

- Connect function generator output at the input of CRO at channel 1 or at channel 2.
- Select proper channel i.e. if signal is connected to channel 1 select CH1 and if signal is connected to channel 2 select CH2.
- Adjust Time/Div. knob to get sufficient time period displacement of the wave on the CRO screen. With fine tuning of time/div make the waveform steady on screen.
- Use triggering controls if waveform is not stable.
- Keep volt/div knob such that waveform is visible on the screen without clipping.
- Measure P-P reading along y-axis. This reading multiplied with volt/div gives peak to peak amplitude of the AC input wave.
- Measure horizontal division of one complete cycle. This division multiplied by Time/Div gives time period of the input wave.

- Calculate frequency using formula f = 1/T.
- Note down your readings in the observation table

OBSERVATIONS

TASK-1:

Calculation Of Frequency Of Basic Waveforms							
Function	Vertical Division	Vertical Sensitivity	Amplitude	Horizontal Division	Horizontal Sensitivity	Time Period	$f = \frac{1}{T}$
	(A)	V/Div (B)	$V_{p\text{-}p}$ (Axb)	(C)	Time/Div (D)	Sec (Cxd)	Hz
Sine							
Square							
Triangular							

TASK-2

DRAW WAVEFORMS USING FUNCTION GENERATOR &CRO AND PLOT IT ON GRAPH PAPER.

Sine wave

$$V_{in} = 3V(p-p), \qquad f = 0.5\ kHz \tag{1.2}$$

Square wave

$$V_{in} = 4V(p-p), \qquad f = 2.5\ kHz \tag{1.3}$$

Triangular wave

$$V_{in} = 5V(p-p), \qquad f = 2.75\ kHz \tag{1.4}$$

DISCUSSION AND CONCLUSION

Evaluation Chart

	Total Marks	Obtained Marks
Participation in the Lab	3	
Accuracy of Results Obtained	4	
Viva	3	
Total	10	

Comments from Lab Instructor:

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Date Instructor's Signature