Unit - II Oscilloscope.

Oscilloscope basic Operation :- The Oscilloscope is basically a graph displaying device - it draws a graph of an electrical signal.

⇒ In most application the graph shows signals change over time, the vertical (Y) axis represented voltage and the horizontal (X) axis represents time

⇒ The intensity or brightness of the display is sometime called the Z axis. In oscilloscope the z axis can be represented by color grading of the display.

This simple graph about a signal

⇒ The time and voltage value of a signal

⇒ The frequency of an oscillating signal

⇒ The "Moving parts" of a circuit represented by the signal

⇒ The frequency with which a particular portion of the signal is occuring relative to the other portion

⇒ Whether or not a malfunctioning component is distorting the signal

⇒ How much of a signal is direct current (DC) or alternating current (AC)

⇒ How much of the signal is noise and whether the noise is changing with time.

Use of Oscilloscope waveforms and waveform measurements.

⇒ The generic learn for a pattern that repeats over time is a wave. Sound waves, brain waves, ocean waves and voltage waves are all repetitive pattern.

⇒ An Oscilloscope measures voltage waves.

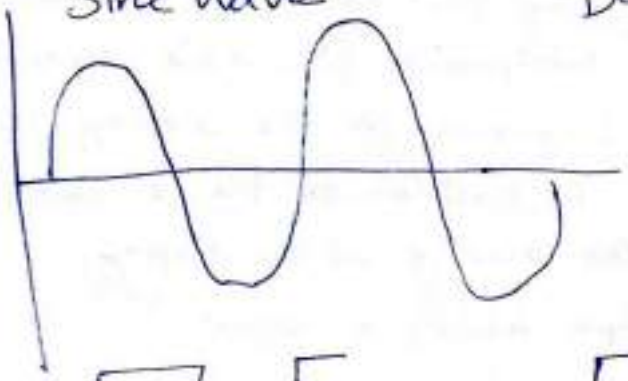
⇒ That physical phenomena such as vibration or temperature or electrical phenomena such as current or Power can be converted to a voltage by a sensor.

The cycle of a wave is the portion of the wave that repeats.

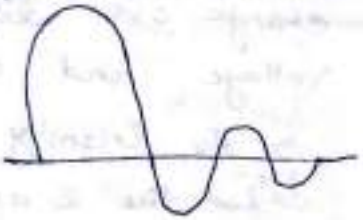
⇒ A waveform is a graphic representation of a wave.

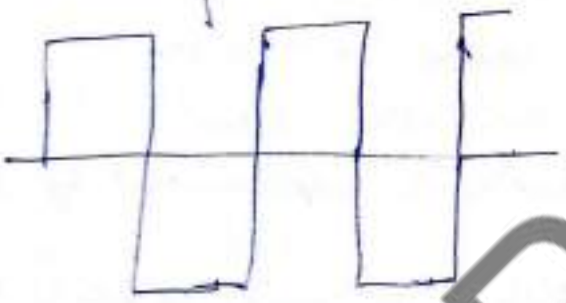
⇒ A voltage waveform shows time on the horizontal axis and voltage on the vertical axis.

Sine wave

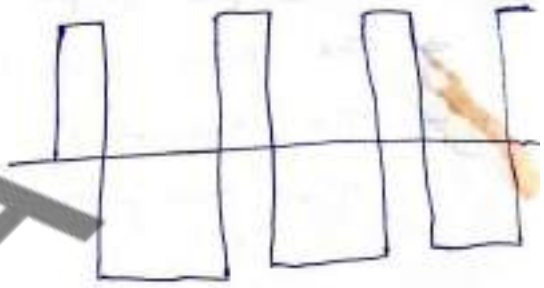


Damped Sin wave

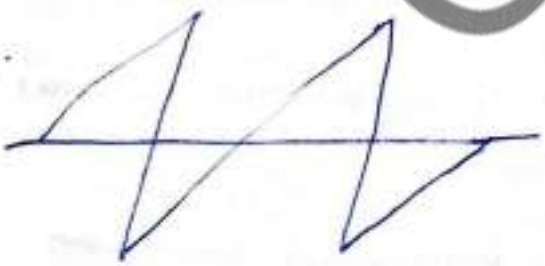




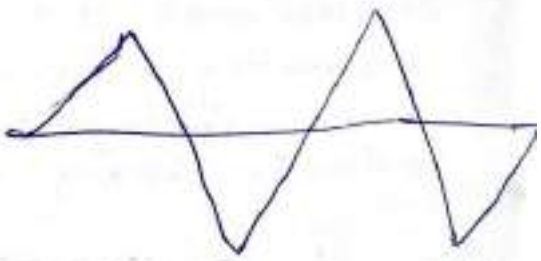
Square wave



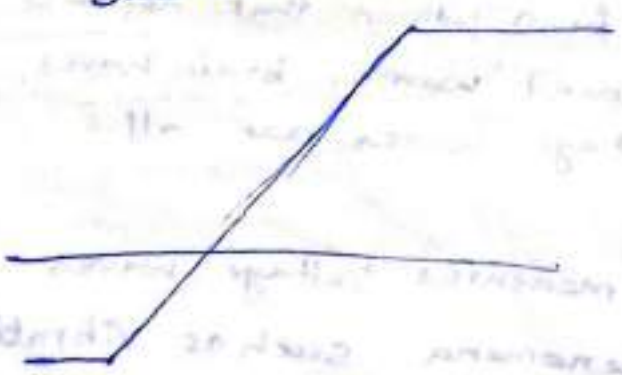
Rectangular wave



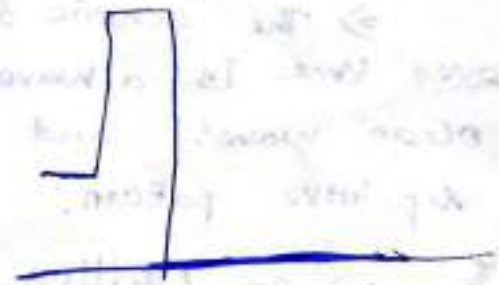
Sawtooth wave



Triangle wave



Step



pulse

=> Waveform shapes reveal a great deal about a signal.

=> Any time a change in the height of the waveform the voltage has changed.

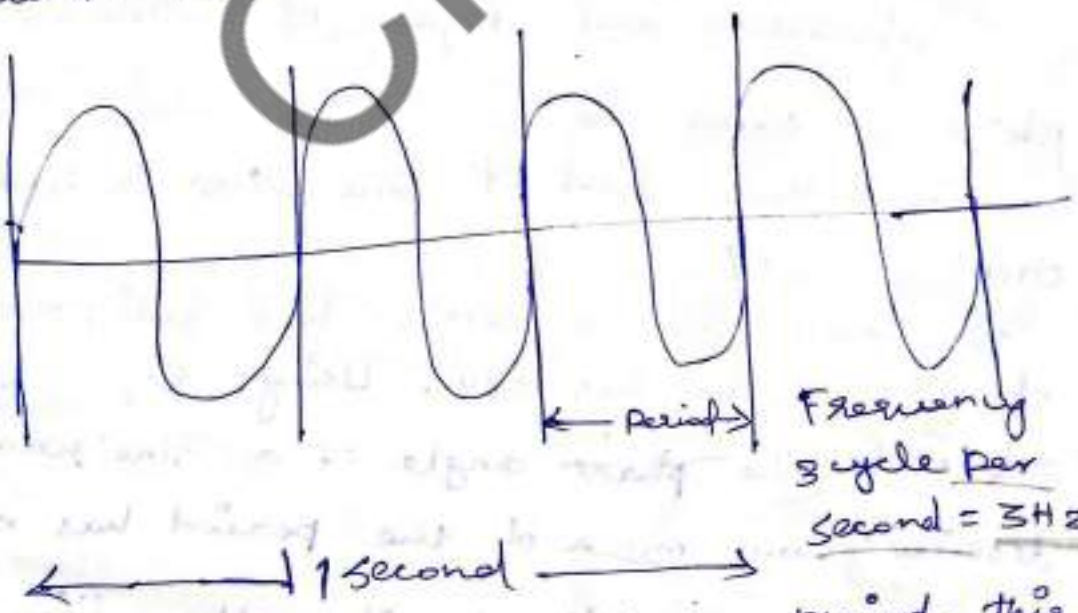
=> Any time there is a flat horizontal line there is no change for that length of time.

=> Straight, diagonal lines mean a Linear change - rise or fall of voltage at a steady rate.

=> Sharp angles on a waveform indicate Sudden change.

Frequency :-

If a signal repeats, it has a frequency. The frequency is measured in Hertz (Hz) and equals the number of times the signal repeats itself in one second. referred to as cycles per second.



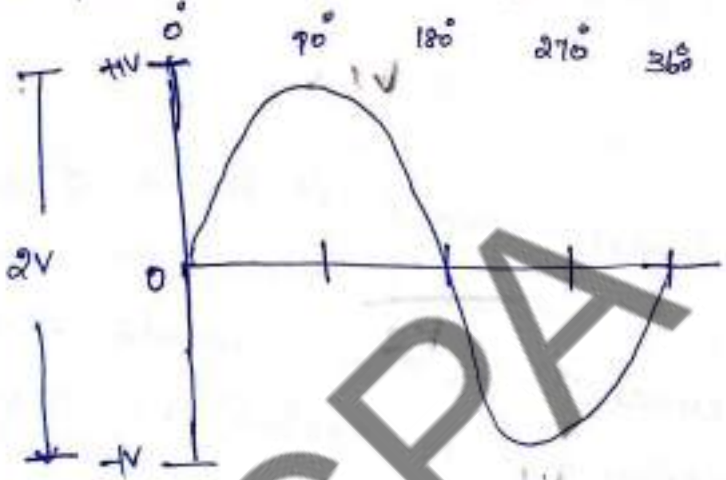
=> A repetitive signal also has a period - this is the amount of time it takes the signal to complete one cycle. period and frequency are reciprocals of each other.

=> So that $\frac{1}{\text{Period}}$ equal the frequency and $\frac{1}{\text{Frequency}}$ equals the periode.

Ex :- The Sine wave has a frequency of 3 Hz and a period of 1/3 second.)

Amplitude :-

Amplitude refers to the amount of voltage between two point in a circuit. Amplitude commonly refers to the maximum voltage of a signal measured from ground or zero volts. The waveform has an amplitude of 1V and a peak to peak voltage of 2V.



Amplitude and degrees of a sine wave.

phase :- ~~phase is~~

The voltage level of sine waves is based on circular motion.

⇒ Given that a circle has 360°, one cycle of a sine wave has 360°. Using degrees you can refers to the phase angle of a sine wave to describe how much of the period has elapsed.

⇒ Phase shift describes the different in timing b/w two similar signals.

⇒ The waveform or "current" is said to be 90° out of phase with the waveform labeled "voltage".

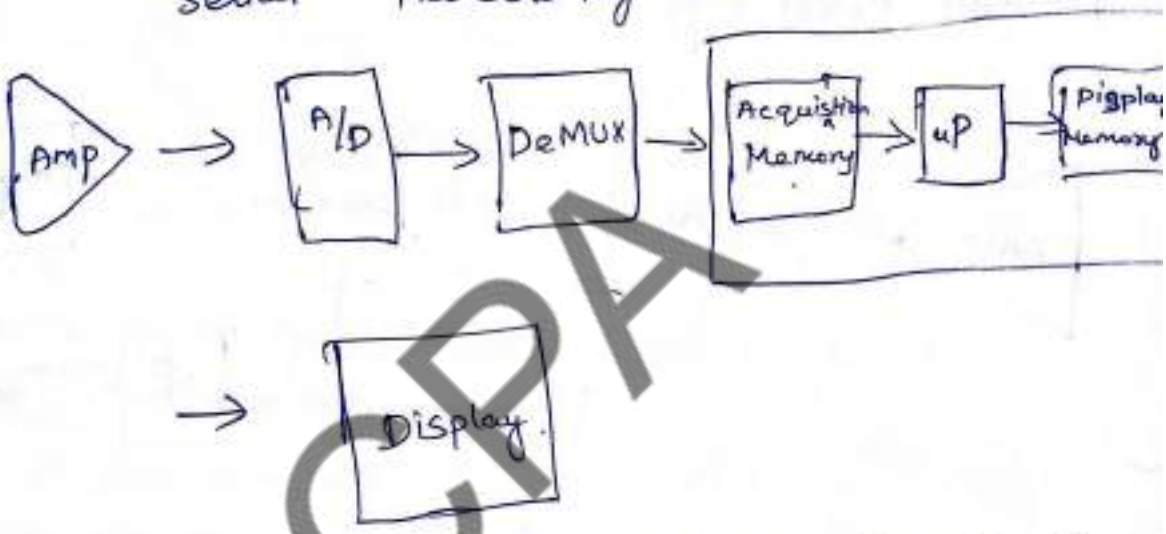
⇒ The waves reach similar points in their cycles exactly 1/4 of a cycle apart (360°/4 = 90°) phase shifts are common in electronics.

Storage Oscilloscopes.

⇒ A conventional digital oscilloscope is known as a digital storage oscilloscope (DSO).

⇒ Its display typically relies on a raster-type screen rather than luminous phosphor.

Serial - Processing DSO



⇒ Digital storage oscilloscopes (DSOs) allow to capture and view events that happen only once. known as transients.

⇒ Because the waveform information exists in digital form as a series of stored binary values.

⇒ It can be analyzed, archived, printed, processed within the oscilloscope by an external computer.

⇒ Analog oscilloscope, digital storage oscilloscope provide permanent signal storage and extensive waveform processing.

⇒ DSO typically have a real time

intensity grading. They cannot express varying levels of intensity in the live signal.

⇒ DSO contain additional data-processing subsystems that are used to collect and display data for the entire waveform.

⇒ A DSO employs a Serial-processing architecture to capture and display a signal on its screen.

parallel processing DSO.