ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

UNIT 5 Part (ii)

Cathode Ray Oscilloscope

Electron Gun

- Electron gun provides a sharply focused electron beam directed toward the fluorescent-coated
- screen. The thermally heated cathode emits electrons in many directions. The control grid
- provides an axial direction for the electron beam and controls the number and speed of electrons
- in the beam.
- The momentum of the electrons determines the intensity, or brightness, of the light emitted from
- the fluorescent coating due to the electron bombardment. Because electrons are negatively
- charged, a repulsion force is created by applying a negative voltage to the control grid, to adjust
- their number and speed. A more negative voltage results in less number of electrons in the beam
- and hence decreased brightness of the beam spot.

The Deflection System

- The deflection system consists of two pairs of parallel plates, referred to as the vertical and
- horizontal deflection plates. One of the plates in each set is permanently connected to the ground
- (zero volt), whereas the other plate of each set is connected to input signals or triggering signal
- of the CRO.
- As shown in Figure above, the electron beam passes through the deflection plates. In reference to
- the schematic diagram in Figure 8, a positive voltage applied to the Y input terminal causes the
- electron beam to deflect vertically upward, due to attraction forces, while a negative voltage
- applied to the Y input terminal causes the electron beam to deflect vertically downward, due to
- repulsion forces. Similarly, a positive voltage applied to the X input terminal will cause the
- electron beam to deflect horizontally toward the right, while a negative voltage applied to the X
- input terminal will cause the electron beam to deflect horizontally toward the left of the screen.

Application

- To measure AC/DC voltages
- To measure frequency of a sinusoidal signalpeaks can be measured and hence, the frequency of the signal is given by f=1/t.
- To measure the phase difference between two signals

Lissajous pattern

- **Used to measure phase and frequency of sinusoidal wave.**
- If two signals are given, one to the X input and another to the Y input,
- X-Y pattern is obtained depending on frequency, amplitude and the phase difference of the two signals.
- Case1: For same frequency and amplitude, the oscilloscope's beam should orbit around a perfect circle or ell ıe screen.