# INDEX

completed

Experiment no. 1

CATHODE RAY OSCILLOSCOPE

## AIM

Study of application of CRO for frequency and amplitude measurements.

## APPARATUS

CRO, function generator (s), a pair of BNC connectors.

## PRINCIPLE

CRO is a graph displaying device that traces graph of a measured electrical signal on its screen. The graph shows signals change over time; with a CRO, the amplitude, period and frequency of a signal can be measured. Also determination of pulse width, duty cycle, rise time and fall time of a pulse wave form are possible. Oscilloscope can display two signals on the screen at a time so that we can observe their time relationship.

## PROCEDURE

i) Switch on the oscillator
ii) Place the time - base knob in horizontal input position and wait for a couple of minutes.
iii) Notice a bright spot of light on the screen of CRO
iv) Now the spot in vertical and horizontal direction by using the horizontal position knob.
v) Vertical position respectively.

# OBSERVATIONS

## Frequency measurements

| | | |
|---|---|---|
| 1. | No. of divisions covered by one cycle $(x)$ = | $x$ div |
| 2. | Time per division factor $(Y)$ = | $y$ sec |
| 3. | Time for one cycle $(T) = (x)(Y) =$ | $xy$ sec |
| 4. | Frequency $(1/T) = \dfrac{1}{xy}$ | KHz |

## Amplitude measurements

| | | |
|---|---|---|
| 1. | Peak to peak distance covered by waveform $(P)$ = | $p$ div |
| 2. | volt per division $(Z)$ = | $z$ volt |
| 3. | peak to peak voltage $(A) = P \cdot Z =$ | $pz$ volt |
| 4. | Amplitude of oscillation $= A/2 = \dfrac{pz}{2}$ | volt |

vi) Place time base in appropriate position

vii) Notice a bright light on CRO screen.

viii) CRO is now ready to measure voltage and frequency of analog signal.

## TO MEASURE FREQUENCY OF A SIGNAL

i) Switch on the CRO. Obtain a sharply defined trace of horizontal line on the screen by adjusting INTENS and FOCUS knobs

ii) Feed the signal whose frequency is to be measured, to either of the channels using a probe and observe the signal on the CRO.

iii) Adjust the TIME/DIV knob so as to see 2 or 3 cycles of the waveform.

iv) Count the number of divisions in one cycle of waveform. Multiply this by the time-base setting. Note down the magnification factor from MAGN Switch. Divide the value obtained by the magnification factor. This is the time period of a signal.

v) Reciprocal of the time-period will give the frequency of the signal.

## TO MEASURE AMPLITUDE OF A SIGNAL

i) Switch on the CRO. Obtain a sharply defined trace of a horizontal line on the Screen by adjusting INTENS and FOCUS knob.

ii) Adjust the y-position knob to make the trace to coincide with the Center line on the Screen by keeping the AC-DC Switch to GND position.

iii) Connect the voltage to be measured to either of the channel using a probe and observe the signal on CRO.

iv) Count the number of divisions occupied by the signal from peak to peak.

v) Multiply this by the Scale indicated by the AMP/DIV knob. This gives the peak to peak amplitude of Signal. Half of this will give the maximum value of voltage.
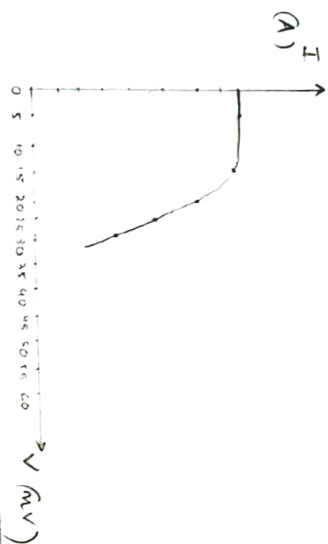
## RESULT

Familiarised with a CRO and its knobs. Also studied how to measure amplitude and frequency of signal :

## AIM

To determine Current - Voltage characteristics of a Solar cell.

## APPARATUS

Solar Panel, voltmeter, milliammeter, resistance box, 100 watt lamp, area choppers etc...

## PRINCIPLE

A graph showing the variation of the voltage and Current of a Solar cell is called as Current - Voltage characteristics. In an open circuit a Solar cell has an output voltage of 0.6 V and zero Current while in a short Current Circuit value becomes maximum and output voltage becomes zero.

## PROCEDURE

1. At first, adjust the lamp intensity to maximum.

2. Measure the voltage in open circuit with zero load resistance.

3. Now introduce load resistance, measure Current and voltage values.

4. Increase the load resistance in steps of and measure the current and voltage values in each Case.

5. Now plot a graph connecting voltage and current connecting voltage and

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# OBSERVATIONS

To Plot Current - voltage characteristics



| S.I No. | RL Ω | Intensity | |
|---|---|---|---|
| | | Voltage (V) | Current (A) |
| 1 | 0 | 22 | .495 |
| 2 | .1 | 67 | .478 |
| 3 | .2 | 111 | .454 |
| 4 | .3 | 145 | .406 |
| 5 | .4 | 176 | .386 |
| 6 | .5 | 200 | .357 |
| 7 | .6 | 218 | .327 |
| 8 | .7 | 236 | .306 |
| 9 | .8 | 253 | .288 |
| 10 | .9 | 266 | .272 |
| 11 | 1 | 278 | .257 |

6. This IV Curve is Called as Output characteristic Curve.

## RESULT

Current - voltage characteristics Curve of Solar cell is plotted.

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