

EE 204 (Class Test)

Max. Marks: 15

Time: 01 hrs

Q1 Explain the following terms:

(a) Accuracy (b) sensitivity (\approx 08 marks)

Sol:

(a) Accuracy:

If it is the closeness with which an instrument reading approaches the true value of the quantity being measured.

— Thus accuracy of a measurement means "conformity to truth".

— The accuracy may be specified in terms of "inaccuracy or limits of error" in the following ways:

(i) Point accuracy: This is the accuracy of the instrument only at one point on its scale.
— This accuracy does not give any information about the accuracy at other points on the scale.

(ii) Accuracy as % of scale range:

when an instrument has uniform scale, its accuracy may be expressed in terms of scale range.
— Usually this manner is not preferred, because as reading on scale range decreases, error ~~also~~ in measurement increases.

(iii) Accuracy as % of True value

- Best way to specify the accuracy in terms of true value of the quantity being measured.

(b) Sensitivity:

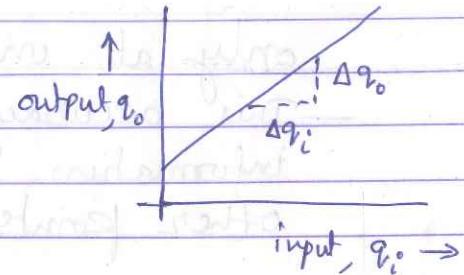
The sensitivity of an instrument is the ratio of the magnitude of the output signal or response to the magnitude of input signal or the quantity being measured.

- Its units are "millimeters per micro-ampere" or "counts per volt" etc. depending upon the type of input & output.

- When the calibration curve is linear, the sensitivity of the instrument can be defined as the slope of the curve.

$$\text{Sensitivity} = \frac{\Delta q_o}{\Delta q_i}$$

(This is constant)

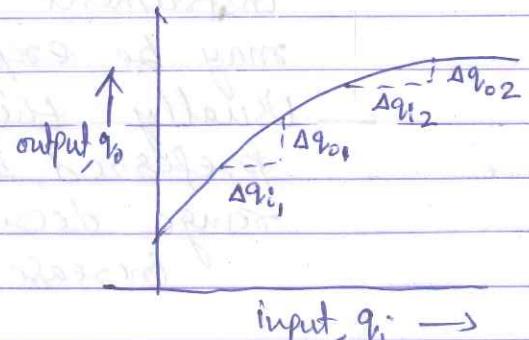


- However if the curve is non-linear, the sensitivity varies with input

$$S_1 = \frac{\Delta q_{o1}}{\Delta q_{i1}}$$

$$\text{&} S_2 = \frac{\Delta q_{o2}}{\Delta q_{i2}}$$

and so on.



Q.2 A 0-150 V voltmeter has a guaranteed accuracy of 1% of full scale range. The voltage measured by this instrument is 75 V. Calculate the limiting error in percent.

→ [07 marks]

Sol:

The magnitude of limiting error of instrument is

$$\Delta A = E_r \cdot A_s$$

where E_r = error defined [Accuracy]
 $= 1\% = \frac{1}{100} = 0.01$

A_s = nominal (specified) value
 $= 150$

$$\therefore \Delta A = 0.01 \times 150 = 1.5 \text{ V}$$

The magnitude of the voltage being measured is 75V

$$\therefore \text{relative error, } E_r = \frac{\Delta A}{A_s} = \frac{1.5}{75} = 0.02$$

$$\boxed{\% E_r = 2 \%}$$