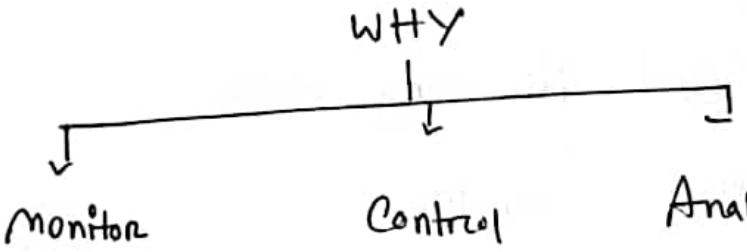
Measurement & Instrumentation

Measurement: Measurement means an unknown quantity is compaired with known standard.

Instrumentation: Process of acquiring data about one or more physical quantities using electrical sensors and instruments.

Why we need measurement / Necessity of measurement:-



Example: In case of Industrial manufacturing →

a) To Improve the quality of the Product.
b) " " " efficiency " " "
c) To maintain the Proper operation.

Measurement is also required to acquire data or information about parameters, interms of → a) Putting the numerical values to the physical quantities b) making measurements otherwise inaccessible. c) Producing data agreeable to analysis.

Data acquisition software → Data is acquired by instrumentation system.

Steps of Generalized Measuring System:

Input → Sensing element → Signal Conditioning element → Signal Processing element → Data Presentation Element → output.

Stage 1:- A detection stage → transducer or sensor.

Example: thermocouple.

Stage 2:- A Signal Conditioning stage.

Example: Amplifier, filter.

Stage 3:- A Signal Processing stage.

Example:- Computer.

Stage 4:- Read out stage.

Example:- Printer, oscilloscope.

Describe different types of measuring instrument:-

Null type Instrument:- An instrument in which zero or null indication determines the magnitude of measured quantity such type of instrument is called Null type instrument.

Ex→ Dc Potentiometer.

Deflection type Instrument:- The instrument in which the deflection provides the basis for measuring the electrical quantity is known as the deflection type instrument.

Ex → Permanent magnet moving coil (PMMC) Ammeter.

Absolute instrument:- The absolute instrument gives the value of measured quantities regarding physical Constant. This physical Constant means the angle of deflection, degree and meter Constant.

Ex → Tangent Galvanometer.

Secondary instruments:- In Secondary instruments the deflection gives the magnitude of electrical quantity to be measured directly.

Ex → Voltmeter, thermometer.

Active instruments:- The quantity being measured simply modulates the magnitude of some external power source.

Ex → Float type Petrol tank level Indicator

Passive Instruments:- The instrument output is entirely produced by the quantity being measured.

Ex → Pressure measuring device.

Analog Instruments:- An analog instrument gives an output that varies continuously as the quantity being measured. Here, output is in Analog form.

Ex → Temperature measurement using thermocouple.

Digital Instruments:- A digital instrument has an output that varies in discrete steps and only have a finite number of values. Here, output is in Digital form.

Ex → Revolution Counter.