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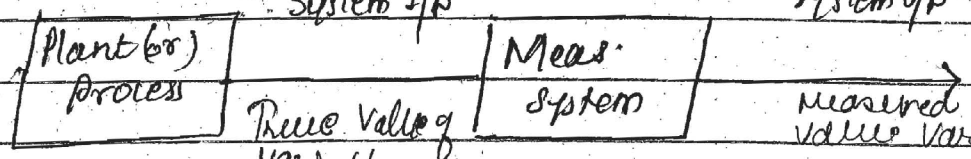
Syllabus

GATE - 6 to 8M.
IES obj → 50 to 60M
Conv → 60 to 70 M.

→ BASICS of measurement system
→ Error Analysis
→ Analog Instruments
→ PMMC, EMMC, MI, ESV, THERMAL Inst.
→ Rectifier Type Inst.
→ Measurement of Resistances
  ~~→ All are a.c~~
  → D C Bridge
→ Measurement of L, C, & M
  → AC Bridges
→ Meas. of power
  → DC & AC power
→ Measu. of Energy
→ Potentiometer
→ p.f. meter
→ flux meter
→ Inst. T/F.
  Electronic
→ Q Meter
→ C.R.O
→ DVM
→ TRANSDUCERS (Only for I.E.S)

→ Bridges & Potentiometer, Measurement of V/g, I, P, Energy & P.f. I.T, D.V.M & DMM, Phase, time & freq. measurent, Oscilloscope & Error analysis

→ Generalized measurement System :-



Error $\delta_A = A_m - A_T$ ·

A_m = measured value

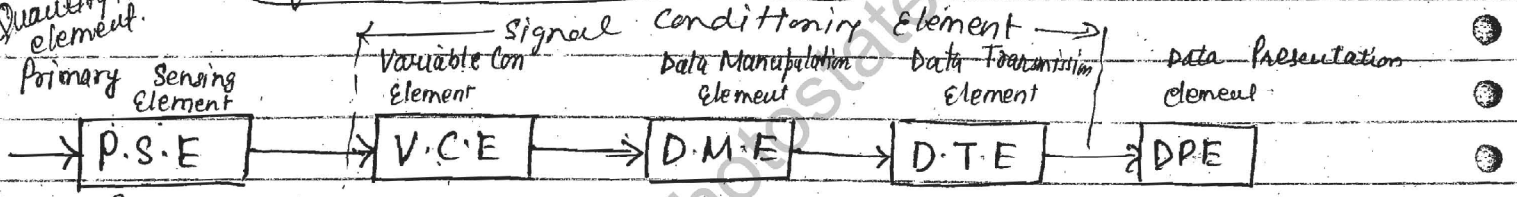
A_T = True value.

Error = System o/p − system I/p

If error = +ve ⇒ $A_m > A_T$

If error = −ve ⇒ $A_m < A_T$

→ Quantity to be element.



Ex:- Sener

Ex:- Thermocouple
↳ Δt

Tachometer
↳ N

Ex:- A→D
D→A
V→I
I→V
V→f

Ex:- Modulator
Amplifier
Attenuator

Ex:- Any x^{no} channel like
Two-wire,
Co-axial cable,
Optical fiber

Ex:- CRO
LCD display
LED "
X-Y recorder

→ Purpose of measurement system is to present an observer with a numerical value, which consists of No. 0-9.

→ Most commonly preffered display is digital display of B.C.D-7 segment type.

→ If the type of display is digital it is more user friendly, easy to readable.

1) Primary Sensing Element :- The element which has direct contact with the process known as primary sensing element (or) sensor (or) Transducer.

→ Transducer is a device which can convert one form of the of energy into another form of energy. That means which can convert non electrical energy into electrical energy.

Variable Conversion Element (VCE):- The element which is used to convert one form of the s/g into another form of signal, the nature of the s/g gets changes at its o/p.
Ex:- ADC, DAC, V/g to Current, Current to V/g, etc.

Data Manupulation element:- The element which is used to modify the level of the s/g, without changing the nature of the s/g. i.e. which can either amplify or attenuate the level of the s/g.

Data Transmission Element (DTE):- The element which is used to transmitte the s/g to the presentation centre.

Data Presentation Element (DPE):- The element which is used to display the data or to store the data for future analysis.

Qeee. In a generalized measurement system the following building blocks are given as
1) VCE 2) DTE 3) DME 4) DPE 5) PSE.
Arrange these blocks in a sequential order. for the purpose of measurement.

→ 5, 1, 3, 2, 4.

NOTE:-

The quality of instrument is always decided by % relative static error, it is always calculated w.r.t. TRUE Value.

Q. $A = \delta A = 1A$ $\delta B = 10Amp$ which one is more quality

a) Only A b) Only B c) both A & B d) None

$$\% \text{ Relative static Error} = \frac{A_m - A_T}{A_T} \times 100 = \frac{\delta A}{A_T} \times 100$$

(or) % R.S.E

(or) % Limiting Error $= \left(\frac{A_m}{A_T} - 1\right) \times 100$

(or) % L.E

L.E = Limiting error

$$\boxed{\% \text{ Accuracy} = 100 - (\% L.E)}$$

Que.

A	B
$\delta_A = 1Amp$	$\delta_B = 10Amp$
$A_T = 2Am$	$B_T = 1000Am$

which one is more accurate

$$\% R.S.E = \frac{\delta A}{A_T} \times 100 = \frac{1}{2} \times 100$$

$\% A.E = 50\%$

$$\% R.S.E = \frac{\delta_B}{B_T} \times 100 = \frac{10}{1000} \times 100$$

$\% A.E = 1\%$

$$\Rightarrow \text{Correction factor} = \frac{1}{1 + \varepsilon_r}$$

ε_r = Relative limiting error.