SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EET206/ Measurements and Instrumentation

II YEAR / IV SEMESTER

UNIT 1- FUNDAMENTALS OF MEASUREMENT

Topic 2 – Types of Measurement systems

SUCCESSFUL STUDENT

Positive Attitude

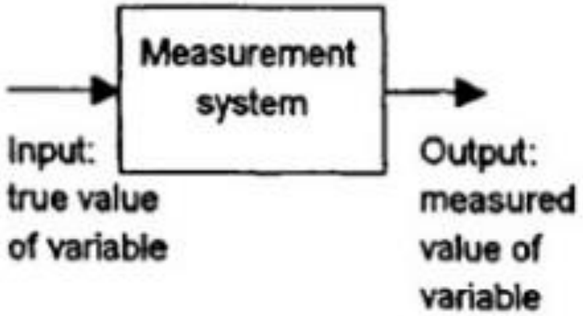
Professionally Groomed

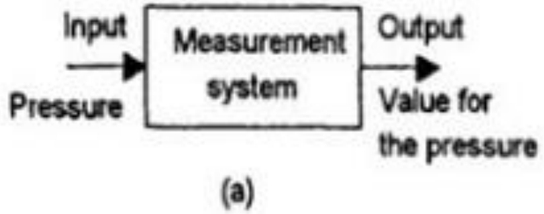
Socially Interactive

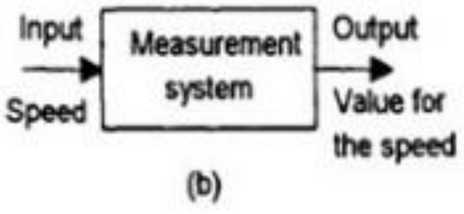
Technically Skillful

Instrumentation Systems

An instrumentation/measurement process can be viewed as a system whose input is the true value of the variable being measured and its output is the measured value.







Examples: (a) pressure measurement, (b) speedometer

The elements of an instrumentation system

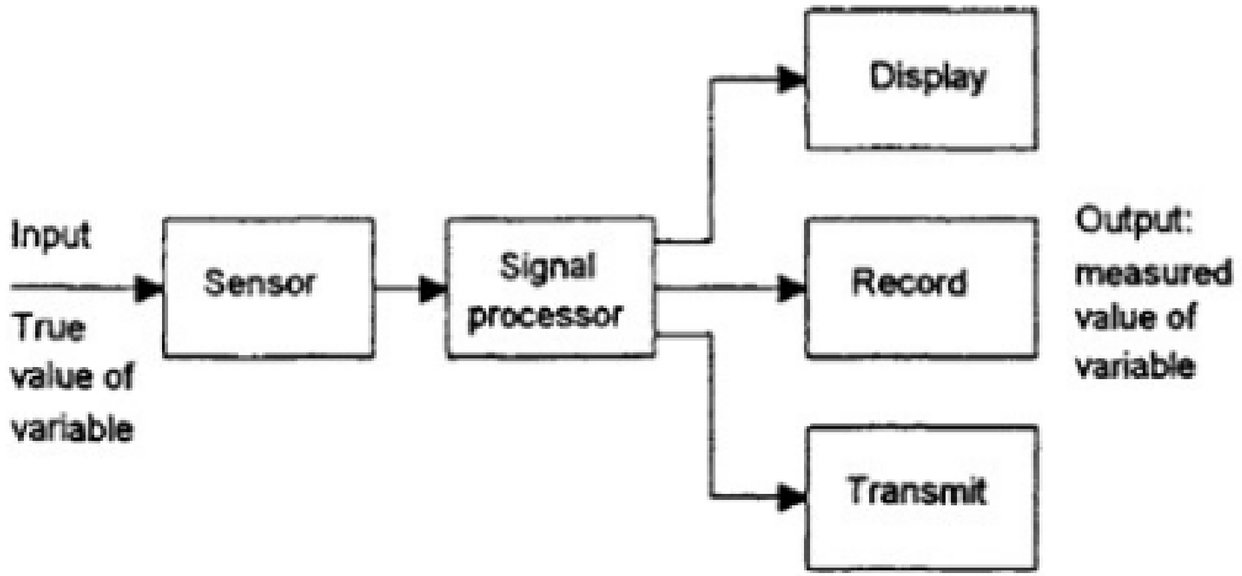


Figure 1.10 *Measurement system elements*

Characteristics of Measurement devices

- **Static:** concerned only with the steady-state reading that the instrument settles down to, such as the accuracy of the reading etc.

- **Dynamic:** describe then transient behavior between the time a measured quantity changes value and the time when the instrument output attains a steady value in response.

Example

A spring balance is calibrated in an environment at a temperature of 20℃ and has the following deflection/load characteristic.

Load (kg)	0	1	2	3
Deflection (mm)	0	20	40	60

It is then used in an environment at a temperature of 30℃ and the following deflection/load characteristic is measured

Load (kg)	0	1	2	3
Deflection (mm)	5	27	49	71

Determine the zero drift and the sensitivity drift per ℃ change in ambient temperature.

Solution

- **At 20℃,** deflection/load characteristic is a straight line with:

  0 mm deflection for no load and **Sensitivity = 20 mm/kg.**

- **At 30℃,** deflection/load characteristic is still a straight line with:

  5 mm deflection for no load and **Sensitivity = 22 mm/kg.**

- Zero drift per ℃ change in ambient temperature =

$$\frac{\Delta(\text{no load deflection})}{\Delta T} = \frac{5-0}{30-20} = 0.5\text{mm}/^{\circ}\text{C}$$

- Sensitivity drift per ℃ change in ambient temperature =

$$\frac{\Delta(\text{Sensitivity})}{\Delta T} = \frac{22-20}{30-20} = 0.2(\text{mm/Kg})/^{\circ}\text{C}$$

ASSESSMENT

REFERENCE

TEXT BOOKS

T1 **A. K. Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai & CO., New Delhi, 2022.**

T2 **S. Gupta and J. John , "Virtual Instrumentation using Lab VIEW", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2010.**

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R1 **David A.Bell, "Electronic Instrumentation and Measurements”, Oxford Higher Education, 2013**

R2 **Bouwens A J, “Digital Instrumentation”, Tata Mc Graw Hill, New Delhi2016**

R3 **Martin U. Reissland, “Electrical Measurement – Fundamental Concepts and Applications”, New Age International (P) Ltd., 2015**

R4 **J. B. Gupta, “A Course in Electronic and Electrical Measurements and Instrumentation”, S. K. Kataria & Sons, Delhi, 2013**

R5 **M. S. Anand, “Electronics Instruments and Instrumentation Technology”, Prentice Hall India, NewDelhi, 2012.**

WEB REFERENCES

W1 **https://pasargadabzar.com/wp-content/uploads/2022/04/Morris_Langari-1.pdf**

W2 **https://www.vssut.ac.in/lecture_notes/lecture1423813026.pdf**

W3 **https://hombredelamancha.com/products/ebook-electrical-and-electronic-measurements-and-instrumentation?srsltid=AfmBOorTb5k9Ga1rsImj69-l3SximYYra7U8VhGcqYahqsfk9BR9rC7k**

THANK YOU!!