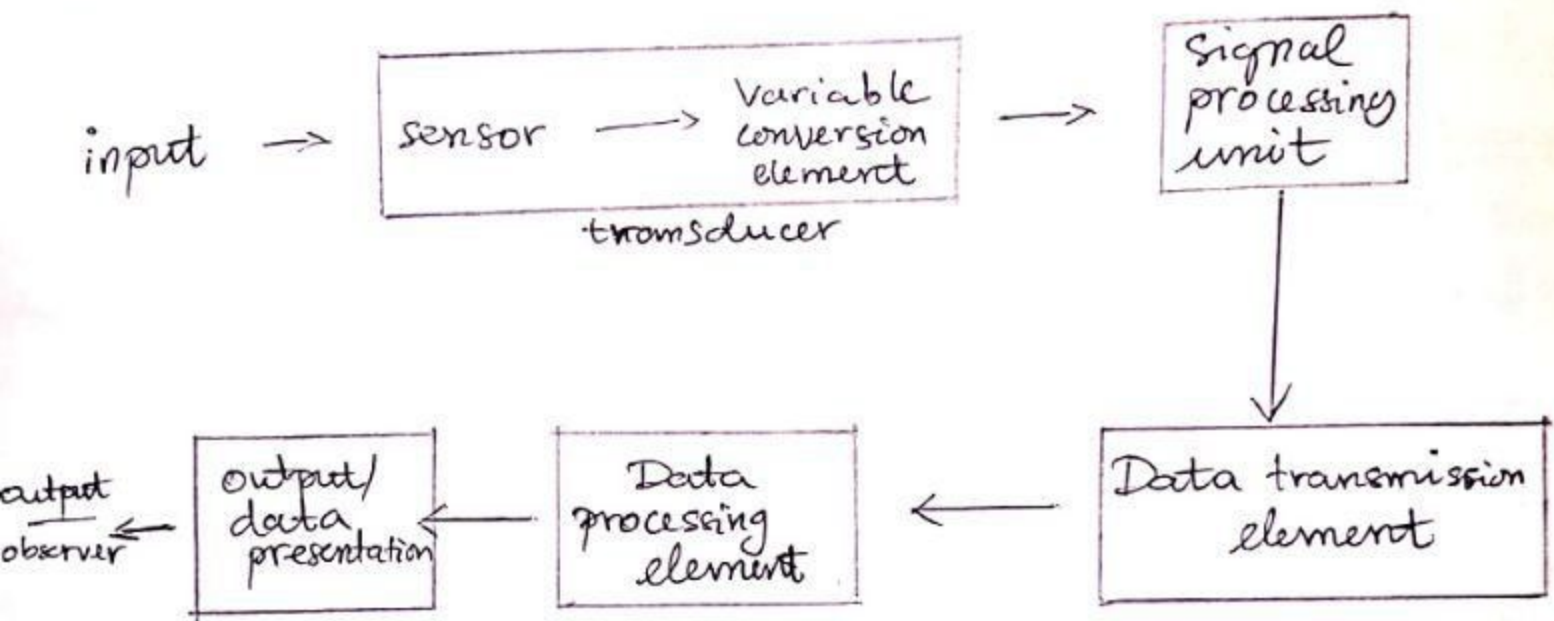# ASSIGNMENT 1: Introduction to measurement

Instructions: Please download, print, provide answers using the space provided, scan and submit on vclass before or on due date

QUESTION

1. _____ With the aid of a well labelled diagram of a typical measuring system, describe the functions of the major components of an electrical measuring system.

input → | Sensor → Variable conversion element | → | Signal processing unit |

transducer

output/observer ← | output/ data presentation | ← | Data processing element | ← | Data transmission element |

① Transducer: the input receives the quantity whose value is to be measured and is converted into an electric signal. The electric signal (such as voltage, current, resistance change, inductance or capacitance) is proportional to the quantity measured.

①-Ⓐ Sensor: is devise or a module whose purpose is to detect events or change in its environment.

①Ⓑ Variable conversion element: converts the output to ar of the sensor in an electric signal.

② Signal processing unit: it takes the output of the transducer and amplify the weak signal. The amplified signal is filtered and modified to a form that is acceptable by the output unit.

③ Data transmission element: it is the channel between the input and output display, It's a communication and can be wired or wireless

④ Data processing element: it is the unit responsible for processing the signal to be passed to the display unit

⑤ output/data presentation: The output from the processing unit is fed to the input of the output unit, which indicates the value to the reader. The output can be visual (LED/LCD screen), or an audio.

2. Define the terms sensitivity, accuracy, linearity, and resolution in relation to measuring instrument performance.

- sensitivity: it is the smallest amount of change that can be detected by a measurement. It is an absolute value and is given by the relation: $\frac{\text{change in instrument output}}{\text{change in measured quantity}}$

- accuracy: it is how close or far is the reading of the instrument from the correct value: how close is the average of all measurements to the real value of what is measured.

- linearity: it is an indicator of consistency of measurements over the range of measurements. The output graph is ideally a straight line, but we sometimes observe deviations. linearity denotes how close those deviations are from a straight line.

- Resolution: it is the smallest measurement an instrument can detect or measure. The higher the resolution, the smaller the measurement it can record. Resolution is the smallest change in measurement value to which an instrument will respond.

3- The inductance of an inductor is specified as 20H ±10% by a manufacturer. Determine the limits of inductance between which it is guaranteed.

The given inductance is 20H ± 10%
The maximum deviation for a full scale reading would be 10% of 20H => $\frac{10 \times 20}{100} = 2H$. The maximum limit is 20+2 = 22 H and the minimum limit is 20-2 = 18H
The limits of inductance is from 18H to 20H.