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 ELECTRONICS & COMMUNICATION ENGINEERING

IIYEAR/ III SEMESTER

23ECT101Basics of Electrical Engineering and Instrumentation

TOPIC -**ERRORS IN MEASUREMENT SYSTEM**

ERRORS IN MEASUREMENT SYSTEM

There are three types of errors that are classified based on the source they arise from; They are:

Gross Errors

Random Errors

Systematic Errors

Gross Errors:

This category basically takes into account human oversight and other mistakes while reading, recording, and readings. The most common human error in measurement falls under this category of measurement errors. For example, the person taking the reading from the meter of the instrument may read 23 as 28.

Gross errors can be avoided by using two suitable measures, and they are written below:

Proper care should be taken in reading, recording the data. Also, the calculation of error should be done accurately.

By increasing the number of experimenters, we can reduce the gross errors. If each experimenter takes different readings at different points, then by taking the average of more readings, we can reduce the gross errors

Random Errors

The random errors are those errors, which occur irregularly and hence are random. These can arise due to random and unpredictable fluctuations in experimental conditions (Example: unpredictable fluctuations in temperature, voltage supply, mechanical vibrations of experimental set-ups, etc, errors by the observer taking readings, etc. For example, when the same person repeats the same observation, he may likely get different readings every time

Systematic Errors:

Systematic errors can be better understood if we divide them into subgroups; They are:

Environmental Errors

Observational Errors

Instrumental Errors

Environmental Errors: This type of error arises in the measurement due to the effect of the external conditions on the measurement. The external condition includes temperature, pressure, and humidity and can also include an external magnetic field. If you measure your temperature under the armpits and during the measurement, if the electricity goes out and the room gets hot, it will affect your body temperature, affecting the reading.

Observational Errors: These are the errors that arise due to an individual's bias, lack of proper setting of the apparatus, or an individual's carelessness in taking observations. The measurement errors also include wrong readings due to Parallax errors.

Instrumental Errors: These errors arise due to faulty construction and calibration of the measuring instruments. Such errors arise due to the hysteresis of the equipment or due to friction. Lots of the time, the equipment being used is faulty due to misuse or neglect, which changes the reading of the equipment. The zero error is a very common type of error. This error is common in devices like Vernier callipers and screw gauges. The zero error can be either positive or negative. Sometimes the scale readings are worn off, which can also lead to a bad reading.

Instrumental error takes place due to :

An inherent constraint of devices

Misuse of Apparatus

Effect of Loading

Different measures of errors include:

Absolute Error

The difference between the measured value of a quantity and its actual value gives the absolute error. It is the variation between the actual values and measured values. It is given by

Absolute error = |VA-VE|

Percent Error

It is another way of expressing the error in measurement. This calculation allows us to gauge how accurate a measured value is with respect to the true value. Per cent error is given by the formula

Percentage error (%) = (VA-VE) / VE) x 100

Relative Error

The ratio of the absolute error to the accepted measurement gives the relative error. The relative error is given by the formula:

Relative Error = Absolute error / Actual value