Instrumentation and measurement
Second year
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Lecture three

Factors Effecting Instrument selection

1- *Accuracy*
Its represent how ***closeness*** with which an ***instrument reading*** approaches the ***true value*** of the variable being measured.
The deviation of the measured value from the true value is the indication of how accurately
reading has been made

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2- *Precision*

It's specified the ***repeatability*** of a set of reading each made independently with the same instrument.
An estimate of precision is determined by the deviation of different reading from the mean (average) value.

Example:
To detect the deference between accuracy and precision of measurement for some voltage, we see the following cases:

i) V=6Volt (true or theoretical value) V=5.8Volt (measured or practical value)
This instrument is accurate

ii) V=6Volt (true or theoretical value) V=4.8Volt (measured or practical value)
This instrument is not accurate

iii) V=6Volt (true or theoretical value) V=5.8Volt (measured or practical value)

When we try to check the reading, we measured it again and again, and get the following
results: second measure for the same reading equal V=5.8Volt, third measured V=5.8Volt,
forth measured V=5.8Volt and so on.
This instrument is accurate and precise

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iv) V=6Volt (true or theoretical value) V=4.8Volt (measured or practical value)
We try to check the reading, we measured it again and again, and get the following results: second measure for the same reading equal V=5Volt, third measured V=4.6Volt,
forth measured V=5.2Volt and so on. This instrument is not accurate and not precise.

3- **Range**

It is defined as that region enclosed by the limits within which a particular quantity is measured.

4- **Span**

It is algebraic difference of the upper and lower limits of the range.

Example:
The span of (0 to10) voltmeter is Span= 10-0=10 state
But the span for (-10 to +10) voltmeter is Span= 10-(-10) =20 state

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*5- **Loading effect***

It's the change of circuit parameter, characteristic, or behaves due to instrument operation without maintains.

6- **Sensitivity**

It's represent the ratio of output signal to a change in input, or its represent the response output of the instrument to a change of its input.

*7- **Resolution***

The smallest change in input that the instrument can response to it, or the ratio of output to smallest change in input.

*8- **Error***

The deviation of the measured value from the true value

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