



DEPARTMENT OF BIOMEDICAL ENGINEERING

III Semester- BM3301 SENSORS AND MEASUREMENTS

UNIT -1

1.4 Dynamic Characteristics of Transducers

1.4 DYNAMIC CHARACTERISTICS:

Dynamic characteristics in measurements refer to the behavior of a measurement system when the ***input quantity being measured is changing over time***. Unlike static characteristics, which focus on steady-state conditions, dynamic characteristics provide insight into how a measurement system responds to rapid changes, fluctuations, or dynamic processes. Understanding these dynamic characteristics is essential for applications involving time-varying quantities or processes. Here are some key dynamic characteristics:

The various dynamic characteristics are:

- i) Speed of response
- ii) Measuring lag
- iii) Fidelity
- iv) Dynamic error
- v) Overshoot
- vi) Settling time
- vii) Damped Oscillations
- viii) Rise Time
- ix) Fall Time

(i) **Speed of response:**

It is defined as the rapidity with which a measurement system responds to changes in the measured quantity.

(ii) Measuring lag:

The delay in the response of an instrument to the changes in the measured quantity is known as measuring lag. The measuring lags are of two types:

1) Retardation type: In this case the response of the measurement system begins immediately after the change in measured quantity has occurred.

2) Time delay lag: In this case the response of the measurement system begins after a dead time after the application of the input.

(iii) Fidelity:

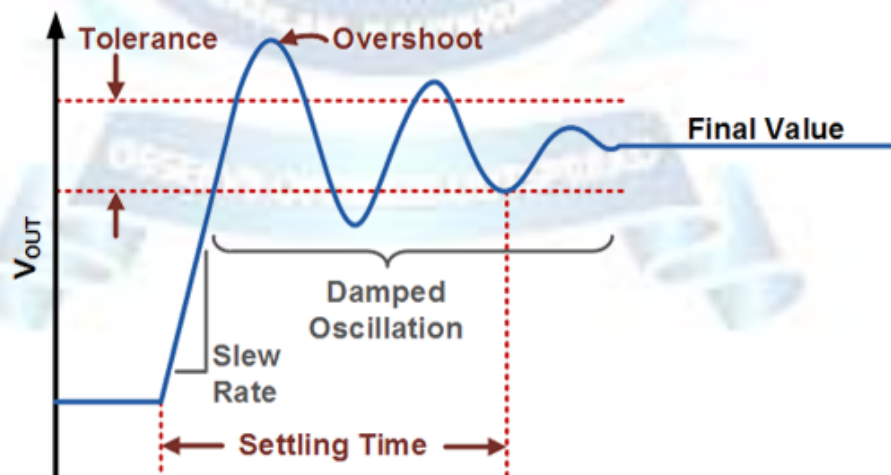
It is defined as the degree to which a measurement system indicates changes in the measurand quantity without dynamic error.

(iv) Dynamic error:

It is the difference between the true value of the quantity changing with time & the value indicated by the measurement system if no static error is assumed. It is also called measurement error.

(v) Overshoot:

The overshoot is evaluated as the maximum amount by which moving system moves beyond the steady state position.



(vi) Settling Time:

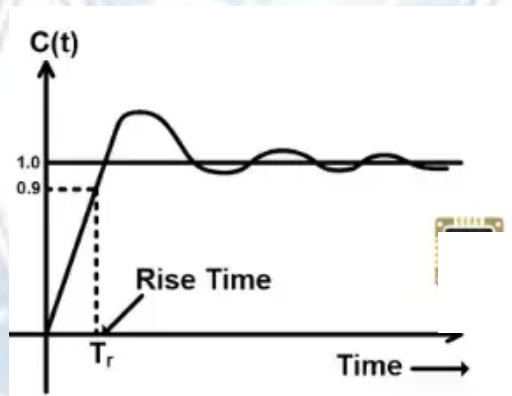
The settling time of a dynamic system is defined as the time required for the output to reach and steady within a given tolerance band.

(vii) Damped Oscillations:

Damped Oscillation is defined as the reduction in amplitude of an oscillating system due to the dissipation of energy.

(viii) Rise Time:

Rise time is the time it takes for the measurement system's output to change from a specified percentage (e.g., 10% to 90%) of the final value in response to a step change in the input. It's a measure of the system's speed in responding to changes.



(ix) Fall Time:

Fall time is the time it takes for the measurement system's output to change from a specified percentage (e.g., 90% to 10%) of the initial value in response to a step change in the input.

