EIC-501

UNIT-3 (Lecture-3)

Time-Domain Specifications

CONTROL SYSTEM-I



Time-Domain Specification

For $0 < \zeta < 1$ and $\omega_n > 0$, the 2^{nd} order system's response due to a unit step input looks like





Time-Domain Specification

• The delay (t_d) time is the time required for the response to reach half the final value the very first time.



CONTROL SYSTEM-I Time-Domain Specification

- The rise time is the time required for the response to rise from 10% to 90%, 5% to 95%, or 0% to 100% of its final value.
- For underdamped second order systems, the 0% to 100% rise time is normally used. For overdamped systems, the 10% to 90% rise time is commonly used.





Time-Domain Specification

• The peak time is the time required for the response to reach the first peak of the overshoot.



Time-Domain Specification

The maximum overshoot is the maximum peak value of the response curve measured from unity. If the final steady-state value of the response differs from unity, then it is common to use the maximum percent overshoot. It is defined by

Maximum percent overshoot $= \frac{c(t_p) - c(\infty)}{c(\infty)} \times 100\%$

The amount of the maximum (percent) overshoot directly indicates the relative stability of the system.

CONTROL SYSTEM-I

Time-Domain Specification

The settling time is the time required for the response curve to reach and stay within a range about the final value of size specified by absolute percentage of the final value (usually 2% or 5%).

