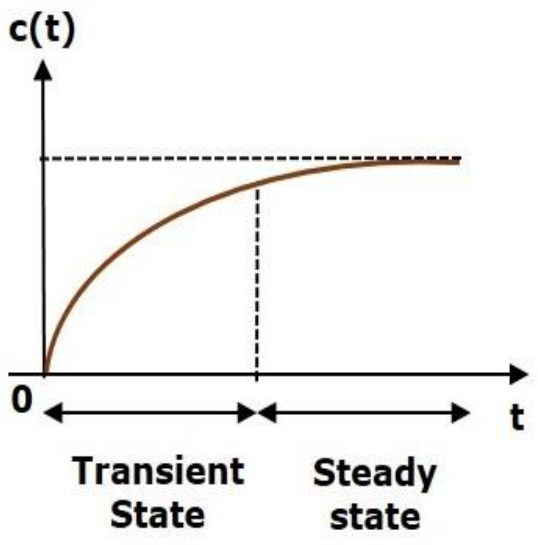
UNIT I

TIME RESPONSE ANALYSIS

INTRODUCTION

- If the output of control system for an input varies with respect to time, then it is called the time response of the control system. The time response consists of two parts.
  - Transient response
  - Steady state response

$$c(t)=c_{tr}(t)+c_{ss}(t)$$



Standard Test Signals

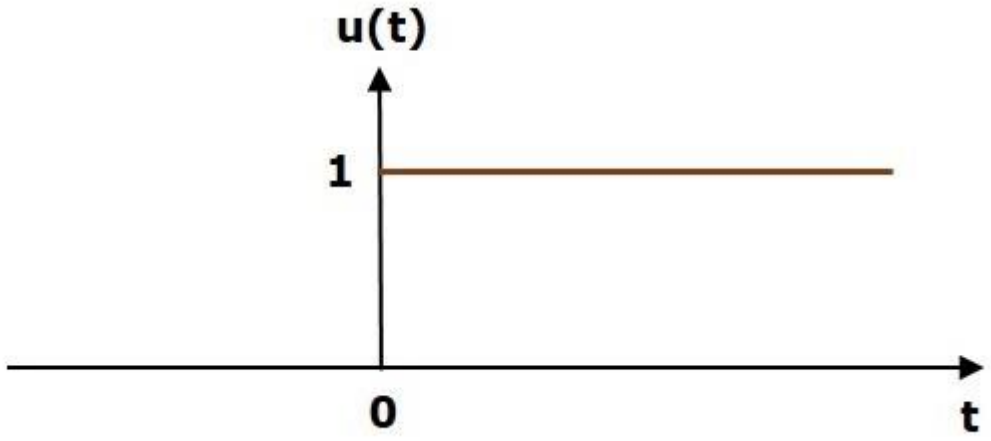
1. Step Signal:

A unit step signal, u(t) is defined as

$$r(t) = Au(t)$$

$$u(t) = 1; t \geq 0$$

$$= 0; t < 0$$



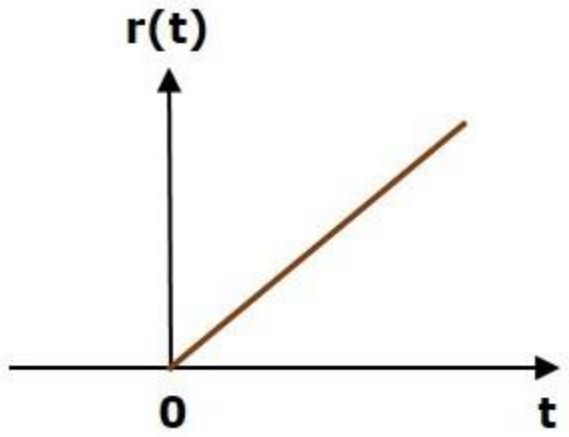
Standard Test Signals

2. Ramp Signal:

Ramp signal is a signal which starts at a value of zero and increases linearly with time.

$$r(t) = At; t \geq 0$$

$$= 0; t < 0$$



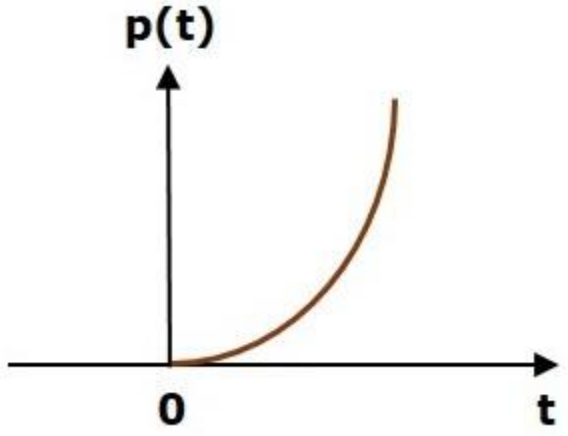
Standard Test Signals

3. Parabolic Signal:

In this signal, the instantaneous value varies as square of the time from an initial value of zero at time t=0.

$$r(t) = \frac{At^2}{2}; t \geq 0$$

$$= 0; t < 0$$



Standard Test Signals

4. Impulse Signal:

A unit impulse signal is defined as a signal which has zero value everywhere except at t=0, where its magnitude is infinite.

$$\delta(t) = 0 \text{ for } t \neq 0$$

$$\text{and } \int_{0^-}^{0^+} \delta(t)dt = 1$$