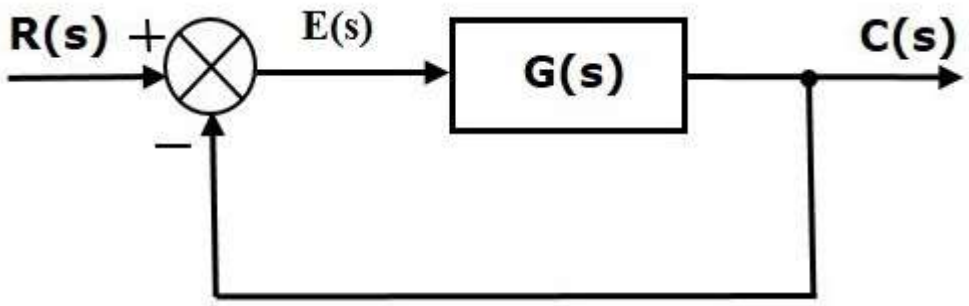
UNIT II

STEADY STATE ERRORS

INTRODUCTION

- The deviation of the output of control system from desired response during steady state is known as steady state error. It is represented as e_{ss}

$$e_{ss} = \lim_{t \to \infty} e(t) = \lim_{s \to 0} E(s)$$



STEADY STATE ERROR

$$\frac{C(s)}{R(s)} = \frac{G(s)}{1+G(s)}$$

$$\Rightarrow C(s) = \frac{R(s)G(s)}{1+G(s)}$$

$$E(s) = R(s) - C(s)$$

$$\Rightarrow E(s) = \frac{R(s)}{1+G(s)}$$

$$e_{ss} = \lim_{s \to 0} \frac{sR(s)}{1+G(s)}$$

STEADY STATE ERROR

- The following table shows the steady state errors and the error constants for standard input signals like unit step, unit ramp & unit parabolic signals.

Input signal	Steady state error e_{ss}	Error constant
unit step signal	$\frac{1}{1+k_p}$	$K_p = \lim_{s \to 0} G(s)$
unit ramp signal	$\frac{1}{K_v}$	$K_v = \lim_{s \to 0} sG(s)$
unit parabolic signal	$\frac{1}{K_a}$	$K_a = \lim_{s \to 0} s^2G(s)$

- Where Kp, Kv, Ka are the position error constant, velocity error constant and acceleration error constant respectively.