

5.6 PI Controller

Consider a feedback system with the plant and controller:

$$G(s) = \frac{2}{s+2}, \quad K(s) = \frac{s+0.5}{s}.$$

What type of controller has the transfer function $K(s)$?

Solution :

$K(s)$ is a PI controller with $K_p = 1$ and $K_i = 0.5$.

GPT Answer :

The transfer function of the controller is given by:

$$K(s) = \frac{s+0.5}{s}.$$

This can be rewritten as:

$$K(s) = 1 + \frac{0.5}{s}.$$

This form reveals that the controller is a Proportional-Integral (PI) controller. The term $\frac{0.5}{s}$ corresponds to the integral component, with a proportional gain of 1 and an integral gain of 0.5.

Confidence level: 95%

Correct

Claude Answer :

To determine the type of controller with the transfer function $K(s) = \frac{s+0.5}{s}$, let's break down the transfer function and analyze its components.

The transfer function $K(s)$ can be rewritten as:

$$K(s) = \frac{s+0.5}{s} = 1 + \frac{0.5}{s}$$

This form reveals that the controller consists of two parts: 1. A proportional term (P): The constant term "1" represents a proportional gain, which amplifies the input signal by a constant factor. 2. An integral term (I): The term $\frac{0.5}{s}$ represents an integral action, which accumulates the input signal over time.

The presence of both proportional and integral terms in the controller transfer function indicates that this is a Proportional-Integral (PI) controller.

A PI controller combines the benefits of both proportional and integral control actions: - The proportional term provides an immediate response to the error signal, helping to reduce the steady-state

error. - The integral term eliminates the steady-state error by continuously adjusting the control signal based on the accumulated error over time.

Therefore, the controller with the transfer function $K(s) = \frac{s+0.5}{s}$ is a Proportional-Integral (PI) controller.

Confidence level: 95%

Correct