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Chapter 1, Problem 4P

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Problem

The automatic control system for the temperature of a bath of liquid consists of a reference voltage fed into a differential amplifier. This is connected to a relay which then switches on or off the electrical power to a heater in the liquid. Negative feedback is provided by a measurement system which feeds a voltage into the differential amplifier. Sketch a block diagram of the system and explain how the error signal is produced.

Step-by-step solution

Step 1 of 2

Draw the block diagram of the automatic control system for the temperature of the bath of liquid.

Figure : Automatic Control System for Temperature of bath of liquid

Comment

Step 2 of 2

The reference voltage corresponds to the desired temperature of the bath. The actual temperature of the bath is measured by the measurement system and sent as a voltage signal to the Comparison element which in this case is the Differential Amplifier. The signal sent by the measurement system is also called Negative feedback. The comparison element adds the reference voltage signal and the measurement system voltage signal and produces an error signal. In this case, the Reference voltage is positive and the Measurement system voltage signal is negative. The error signal can thus be written as,

Error Signal = Reference Voltage Signal – Measurement System Voltage Signal

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