Assignment 1

Due on 08/01/10, 08:00 AM

Unit 4 - Week 1

Course Outline

Week 1

Unit 4

1. Introduction to Control Systems
2. Linear System Models
3. Feedback Control Systems
4. Control System Analysis
5. Control System Design

Assignment

Problem 1

Consider a system described by the differential equation:
\[ \frac{dv}{dt} + 2v + 3u = 0 \]
where \( v \) is the output and \( u \) is the input. Determine the steady-state value of \( v \) when the input \( u \) is a step function with magnitude 1.

1 point

Problem 2

A control system is represented by the transfer function:
\[ G(s) = \frac{1}{s^2 + 2s + 1} \]
Determine the frequency response of the system in the Laplace domain.

1 point

Problem 3

Consider the block diagram of a control system shown below. Determine the transfer function \( G(s) \).

1 point

Problem 4

The transfer function of a system is given by:
\[ G(s) = \frac{1}{s^2 + 3s + 2} \]
Determine the steady-state response of the system to a constant input of magnitude 5.

1 point

Diagram

1. \[ \text{System block diagram} \]
2. \[ \text{Transfer function} G(s) = \frac{1}{s^2 + 2s + 1} \]
3. \[ \text{Steady-state response} \]
4. \[ \text{Diagram of control system} \]

The heat in a coulomb is defined as \( E = qV \). Which of the following equations correctly describes the law of conservation of energy?

1 point

Diagram

1. \[ \text{Law of conservation of energy} \]
2. \[ \text{Coulomb's law} \]
3. \[ \text{Energy conservation} \]
4. \[ \text{Heat equation} \]