

《现代控制理论》

图书基本信息

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内容概要

《普通高等教育"十二五"规划教材:现代控制理论(英文版)》内容共分为6章, 主要涉及系统建模、系统分析和系统优化设计。第1章通过引入控制系统的一些基本概念, 给出了系统的数学描述方式, 例如: 状态空间模型, 传递函数矩阵。第2章在时域内对系统进行了定量分析。第3章和第4章主要进行了系统的定性分析。其中, 第3章讨论了系统的稳定性问题, 第4章讨论了系统的能控性和能观性问题。第5章研究了系统综合设计的方法, 例如: 状态反馈, 利用状态观测器进行状态重构。在第6章中, 研究了离散系统的建模、分析与综合设计。

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Example 1 . 1 A very simple RLC network shown in Figure 1 . 1 is considered . Suppose that the voltage $u(t)$ is the input to the RLC network . This circuit contains two energy-storage elements: the inductor and the capacitor . Applying Kirchhoff's laws, the voltage $u_c(t)$ across the capacitor C and the current $i_L(t)$ through the inductor L satisfy the following differential equations . The second-order differential equation (1 . 4) is called the differential equation description of the system . The differential equation description can be directly converted to the transfer function description by Laplace transform . By taking the Laplace transform of (1 . 4) and assuming the zero initial conditions hold true, the transfer function description of the RLC network is obtained as From the description (1 . 4) and (1 . 5) , it can be seen that the differential equation description and the transfer function description are all the external descriptions of a system . If we make the definitions, $x_1(t) = u_c(t)$ and $x_2(t) = i_L(t)$, for $t \in (0, t]$, the following differential equations can be obtained from (1 . 1) and (1 . 2) . The set of the differential equations in matrix form (1 . 8) or (1 . 9) is called the state equation of the system . The set of the algebraic equations in the matrix form (1 . 11) is called the output equation of the system . Both the state equation and the output equation are called the state space description of a system . The state space description is an internal description of system .

Lyapunov asymptotically stability means that we are able to select a bound on initial condition, that will result in the state trajectory which remains within a chosen finite limit and will return to x_e . The geometrical implication of Lyapunov asymptotically stability is shown in Figure 3 . 2 . Definition 3 . 9 If δ , which is appear in (3 . 19) and indicates the bound on initial condition, is not the function of t_0 and the equilibrium point x_e is stable $i . s . L$, then x_e is said to be uniformly stable . Definition 3 . 10 If δ , which is appear in (3 . 19) and indicates the bound on initial condition, is not the function of t_0 and the equilibrium point x_e is asymptotically stable $i . s . L$, then x_e is said to be uniformly asymptotically stable . Definition 3 . 11 If the equilibrium point x_e is asymptotically stable $i . s . L$ for any initial state, then the equilibrium point x_e is said to be globally asymptotically stable or asymptotically stable in the large

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