

<<现代控制理论>>

图书基本信息

书名：<<现代控制理论>>

13位ISBN编号：9787118079975

10位ISBN编号：7118079979

出版时间：2012-3

出版时间：国防工业出版社

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页数：186

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内容概要

本书内容共分为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，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、分析综合设计。

本书可作为自动化、电气工程及其自动化等专业高年级本科生以及控制科学与工程、电气工程等学科研究生学习现代控制理论双语课程的教材也可作为学习高级宏观、微观经济学的经济、管理学科研究生的辅助教材。

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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 $\forall \epsilon \in (0, \infty)$, 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 $\forall \epsilon \in (0, \infty)$, then x_e is said to be uniformly asymptotically stable . Definition 3 . 11 If the equilibrium point x_e is asymptotically stable $\forall \epsilon \in (0, \infty)$ 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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