

# State Variable Approach

The conventional control theory which is applicable to linear time-invariant systems having single input and single output has already been discussed. The conventional control theory cannot be applied for time varying and/or non-linear systems. In the conventional control theory the main theme is to formulate the transfer function putting all initial conditions to zero. On the other hand, state variable analysis, i.e., the modern control theory automatically, takes care of initial conditions and it is also possible to analyse time-varying or time-invariant, linear or non-linear, single or multiple input-output systems. The main purpose of this chapter is to introduce state variable analysis.

*State Variable Analysis*

## 17.1 ADVANTAGES AND DISADVANTAGES OF MODERN CONTROL THEORY

### Advantages

- It is possible to analyse time-variant or time-invariant, linear or non-linear, single or multiple input-output systems.
- It is possible to confirm the state of the system parameters also and not merely input-output relations.
- It is possible to optimise the systems useful for optimal design.
- It is possible to include initial conditions.

### Disadvantages

- Techniques are complex.
- Many computations are required.

## 17.2 BASIC CONCEPTS

**State:** The state of a dynamic system is the smallest set of variables and the knowledge of these variables at  $t = t_0$  together with inputs for  $t \geq t_0$  completely determines the behaviour of the system at  $t \geq t_0$ . A compact and concise representation of the past history of the system can be termed as the state of the system.

**State variables:** The smallest set of variables that determine the state of the system are known as state variables. The knowledge of capacitor, voltage at  $t = 0$ , i.e., the initial voltage of the capacitor is a history-dependent term and it forms a state variable. Similarly, initial current in an inductor is treated as a state variable.

**State vector:** The  $n$  state variables that completely describe the behaviour of a given system are said to be  $n$  components of a vector.

**State space:** The  $n$ -dimensional space whose coordinate axes consist of the  $x_1$  axis,  $x_2$  axis, ...,  $x_n$  axis is known as a state space.

# State Variable Approach To Continuous Es

**Lingsheng Yao**



## **State Variable Approach To Continuous Es:**

## Decoding **State Variable Approach To Continuous Es**: Revealing the Captivating Potential of Verbal Expression

In a time characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its ability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**State Variable Approach To Continuous Es**," a mesmerizing literary creation penned by a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring effect on our lives. In this appraisal, we shall explore the book's central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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