

Preface

Power system electromechanical low-frequency oscillations threaten the stable operation of power systems. A great effort has been spent by many researchers for over half-century in order to understand and solve this complicated engineering problem. There are two main methods for the analysis and damping control of power system low-frequency oscillations. They are the damping torque analysis and modal analysis based on the linearized models of power systems for the study of small-signal angular stability. In this book, they are named as linearized methods or small-signal methods. The damping torque analysis is simple and of clear physical meaning. The phase compensation method developed on the basis of damping torque analysis for the design of power system stabilizers (PSSs) has been widely used in practice. The modal analysis is based on the modal control theory and has been the mostly used method in large-scale multi-machine power systems. This book is devoted to the introduction of those two linearized methods and their applications in the design of conventional PSSs and more recently appeared FACTS stabilizers. It is written as a textbook for postgraduate research students and a reference book for power system researchers. In addition to the introduction of modal analysis, great attention has been paid in the book to elaborate the principle and applications of the damping torque analysis, which we have applied in our research on the subject in recent 20 years.

We have used the main materials in this book in teaching and tutoring our research students for years. Some examples in the book are the results of their exercise work before starting their research projects. We would like to acknowledge their contributions to the preparation of examples in the book. They are Yifu Lin, Xiangfeng Wang, Yan Zhang, Shen Yang, Qianhui Wan, Ximin Li (Sect. 2.4), Chen Lv (Sect. 3.3), Yi Ge (Sect. 4.4), Tianyu Su (Sect. 5.3), Zhijin Zhen (Sect. 6.3), and Xiaobo Hu (Sect. 7.4.2).

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