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""2.2.2 Induction Machine Modeling in Complex Vector""""""2.2.2.1 Model in Per-Unit System""; ""2.2.3 Swing Equation""; ""2.3 DFIG Modeling""; ""2.3.1 Wind Turbine Aerodynamics Model""; ""2.4 Examples""; ""2.4.1 Example 1: Free Acceleration""; ""2.4.1.1 Induction Machine Simulink Model""; ""2.4.2 Example 2: DFIG Stator Voltage Drop""; ""References""; ""Chapter 3: Modeling of Doubly Fed Induction Generation (DFIG) Converter Controls""; ""3.1 Rotor Flux-Oriented Induction Machine Control""; ""3.1.1 Torque/Flux Control""; ""3.1.2 Inner Current Control""; ""3.2 DFIG Rotor Side Converter Control""
""3.2.1 Outer Control""""""3.2.2 Inner Current Control""; ""3.2.3 Maximum Power Point Tracking""; ""3.3 GSC Control""; ""3.3.1 Outer Control""; ""3.3.2 Inner Current Control""; ""3.4 Complete DFIG Modeling Blocks""; ""3.5 Examples""; ""3.5.1 Example 1: PSCAD Simulation of a Two-Level VSC with Sine PWM""; ""3.5.2 Example 2: DFIG Simulation""; ""References""; ""Chapter 4: Analysis of DFIG with Unbalanced Stator Voltage""; ""4.1 Steady-State Harmonic Analysis of a DFIG""; ""4.1.1 Steady-State Equivalent Circuit of a DFIG""; ""4.1.2 Harmonic Components in Stator and Rotor Currents""
""4.1.3 Harmonic Components and Magnitudes of Electromagnetic Torque""""""4.1.4 Example""; ""4.2 Unbalanced Stator Voltage Drop TransientAnalysis""; ""4.3 Converter Control to Mitigate Unbalance Effect""; ""4.3.1 Negative Sequence Compensation via GSC""; ""4.3.1.1 Drawbacks of GSC Compensation""; ""4.3.2 Negative Sequence Compensation via RSC""; ""4.3.2.1 Dual-Sequence RSC Control""; ""4.3.2.2 Proportional Resonant RSC Control""; ""4.3.2.3 Drawbacks of RSC Compensation""; ""References""; ""Chapter 5: State-Space Based DFIG Wind Energy System Modeling""
""5.1 State-Space Model of a SeriesCompensated Network""""""5.2 State-Space Model of DFIG Wind Energy System""; ""5.2.1 Induction Generator Model""; ""5.2.2 DC-Link Model""; ""5.2.3 Torsional Dynamics Model""; ""5.2.4 DFIG Converter Controls""; ""5.3 Integrated System Model""; ""5.4 Application of SSR Analysis""; ""5.4.1 Introduction""; ""5.4.2 Analysis of SSR in a DFIG""; ""5.4.3 Impact of Wind Speed and Compensation Level on SSR""; ""5.4.4 Impact of DFIG Current Controllers on SSR""; ""5.4.5 Results of TI Effect""; ""5.4.5.1 Impact of Compensation Level on Torsional Mode""
""5.4.5.2 Impact of Wind Speed on TI""

Sommario/riassunto

Wind Energy Systems: Modeling, Analysis and Control with DFIG provides key information on machine/converter modelling strategies based on space vectors, complex vector, and further frequency-domain variables. It includes applications that focus on wind energy grid integration, with analysis and control explanations with examples. For those working in the field of wind energy integration examining the potential risk of stability is key, this edition looks at how wind energy is modelled, what kind of control systems are adopted, how it interacts with the grid, as well as suitable study approaches. Not only giving principles behind the dynamics of wind energy grid integration system, but also examining different strategies for analysis, such as frequency-domain-based and state-space-based approaches. Focuses on real and reactive power control Supported by PSCAD and Matlab/Simulink examples Considers the difference in control objectives between ac drive systems and grid integration systems