Sādhanā Vol. 42, No. 8, August 2017, pp. 1225
DOI 10.1007/s12046-017-0712-y

Power electronics

Foreword

This special issue of Sadhana is a compilation of papers selected from those presented at the 7th National Power Electronics Conference (NPEC), held at the Indian Institute of Technology, Bombay, on 21–23 December 2015. From among the papers presented in NPEC-2017, selected papers were peer-reviewed for possible publication, and 18 papers were chosen for inclusion in this issue.

Power electronics plays an important role in the processing, conditioning and utilization of electric power. From ubiquitous mobile-phone battery chargers to large wind-turbine interfaces, power electronics affects many aspects of human activity. The papers in this issue have been broadly classified into four tracks.

The first four papers address the circuits aspects of power electronics. These papers include discussions on design issues related to power electronic converters. An induction motor drive based on a modular multilevel converter (MMC) is presented, followed by a paper on the important issue of module capacitor pre-charging in MMCs.

The next five papers are concerned with power electronic converter control and analysis. They include a method of active power decoupling in single-phase grid-connected power electronic converters, the control of an inverter for induction cooking, the analysis of a series-resonant converter under discontinuous conduction, the control of a single-phase dynamic voltage restorer and the control of an induction motor drive having an active front end converter.

Four papers concerned with microgrids and renewable energy follow. A paper describing a method of power transfer with boost converter topologies in the context of small grids is followed by one on the estimation of impedance of photovoltaic modules to enable effective photovoltaic inverter start-up. Also included is work on the transition between grid-connected and islanded modes for microgrids, and work on battery impedance estimation using a grid-connected converter.

The final five papers are on the broad topic of electric machines and drives. They include a paper on a specific implementation of vector control with an induction motor drive, the design and fabrication of a linear permanent-magnet synchronous machine, design and implementation of sensorless control for a surface-mounted permanent-magnet synchronous machine, the estimation of the moment of inertia and damping of motor and load in an induction motor drive, and a study of instability at light loads in induction motor drives.

The selected papers cover a wide range of issues related to power electronics. We hope that they will serve as useful reference material for power electronics engineers, students and academicians. We thank the editors of Sadhana for inviting us to guest-edit this special issue on power electronics.

July 2017

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