PLL strategies of grid connected converters under distorted input voltages

Petr Šimek, Jiří Škramlík, Viktor Valouch

Abstract. The structures and basic performances of different phase locked loops (PLLs) are investigated and compared regarding how the PLLs can cope with grids that contain both the positive and negative sequence components and/or even non-periodic disturbances. The delayed signal cancellation (DSC) technique is tested by simulation and experiments. A modified cascaded DSC is developed and tested in laboratory.

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Finite element based simulation of induction heating the moving cylindrical ferromagnetic billets

Vladimir Dmitrievskii, Vladimir Prakht,
Fedor Sarapulov

Abstract. Mathematical model making allowances for the billet's phase heterogeneity as well as voltage difference in various inductor turns and the current density nonuniformity in the tube section is proposed. It is shown that proper mathematical modeling the process of induction heating of moving cylindrical ferromagnetic billets, using the finite element method, requires a solution of the coupled heat and electromagnetic boundary problem, supplemented by additional degrees of freedom, describing the nonuniformity of the voltage distribution in the inductor turns.

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Analysis of induction motors features taking into account change of iron properties

Mykhaylo Zagirnyak, Vita Ogar,
Vladimir Chenchevoi

Abstract. Equivalent circuits as well as induction motor (IM) specified mathematical models are offered taking into account the nonlinearity of magnetization curve, hysteresis and eddy currents phenomena. Static, power and dynamic of induction motor are investigated considering these phenomena. Harmonic analysis of IM currents in the idle mode is carried out. It is demonstrated that taking into account the magnetization curve nonlinearity in the mathematical model results in coincidence of characteristics obtained by mathematical modeling with experimental curves. Influence of increase of eddy currents losses on IM characteristics is shown. The adequacy of the proposed mathematical model is confirmed by experimental research.

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Skin effect in the time domain via vector potentials

Malcolm S. Raven

Abstract. The vector potential method is used to solve the problem of transient conduction and skin effect in cylindrical conductors. Several time dependent current sources are analyzed including linear, quadratic and exponential. The stability factor is determined and the results for each case are presented. A simple method of measuring the skin effect using a digital multimeter is suggested.

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Radiative and chemically reactive double diffusive convective flow past a vertical surface with constant heat flux

Arpita Jain

Abstract. Radiation and chemical reaction effects on flow past a vertical accelerated plate are analyzed. The governing equations are solved in a closed form by Laplace-transform technique. The results are obtained for temperature, concentration, velocity, skin friction, Nusselt number and Sherwood number. The effects of various parameters on flow variables are illustrated graphically and the physical aspects of the problem are discussed.

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Analysis of cascaded canonical dissipative systems and LTI filter sections

Marco Reit, Ruedi Stoop, Wolfgang Mathis

Abstract. Nonlinear dynamic systems exhibiting an Andronov–Hopf bifurcation are investigated. By adding a forcing term, we analyze the transmission behavior of different nonlinear dynamic systems near the onset of an Andronov–Hopf instability. In this context, especially the behavior of canonical dissipative systems is of interest. We compare the transmission behavior related to structural differences of the considered systems. As an example, we use a suitable cochlea model, composed by a chain of alternating Hopf amplifiers and LTI filter sections, to examine the similarities and differences of the systems in a more complex environment.

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Analysis of MHD flow and heat transfer due to a non-linearly permeable stretching surface

Rafael Cortell

Abstract. The flow and heat transfer characteristics of a viscous fluid over a permeable stretched planar surface with non-linearly (quadratic) velocity and appropriate wall transpiration under the influence of a transverse magnetic field is investigated. A novel result of the analysis is that for a given viscous fluid subjected to appropriate wall transpiration, the velocity and temperature fields depress with increase in the magnetic parameter.

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