Abstracts

ELECTROENGEENIRING: Prominent events and great names

Baranov M.I.

Heinrich Rudolf Hertz was the first to discover electromagnetic waves.

The paper presents a brief historical overview of Hertz's discovery of electromagnetic waves and 5 further triumph of Maxwell's electromagnetic field theory.

Key words – **history, theory, discovery, electromagnetic wave, electromagnetic field.**

Electrical Mashines and Apparatus

Gurevich V. 12

Nonconformance in electromechanical output relays of microprocessor-based protection devices under actual operating conditions.

Microprocessor-based protection relays are gradually driving out traditional electromechanical and even electronic protection devices from virtually all fields of power and electrical engineering. In this paper, one of many problems of microprocessor-based relays is discussed: nonconformance of miniature electromechanical output relays under actual operation conditions: switching inductive loads (with tripping CB coils or lockout relay coils) at 220 VDC, and "dry" switching of some control circuits. We suggest a simple and very reliable solution to this problem: an electronic amplifier for increase in switching ability of the output relays.

Key words – **microprocessor-based protection relay, electromechanical output relay, actual operating conditions, nonconformance.**

Branspiz Yu.A., Zagirnyak M.V., Pshenichniy A.N. 17

Account of magnetic properties of shell-type electromagnet magnetic circuit material in calculation of tractive characteristic.

It is shown that use of a single-loop equivalent circuit of a shell-type electromagnet magnetic circuit makes it possible to take into account magnetic properties of the electromagnet magnetic circuit material in calculation of traction force according to a proposed method.

Key words – **equivalent circuit, vector potential, traction force.**

Vasyliv K.M., Galinovskiy O.M. 21

Analysis of dynamic processes in a self-contained electric system based on an asynchronous motor with a noncontact cascade three-phase-three-phase modulated driver and a commutator under scheme-zero in active-inductive load operation.

The paper presents analysis of dynamic electromagnetic processes in a self-contained electric system based on an asynchronous motor with a noncontact cascade three-phase-three-phase modulated driver and a commutator according to scheme-zero under active-inductive load operation. The basic mechanisms of the dynamic electromagnetic processes are revealed subject to the modulator circuit and commutator control system parameters.

Key words – **dynamic electromagnetic process, self-contained electric system, asynchronous motor, analysis.**

Vas'kovskiy Yu.N., Gaidenko Yu.A., Tsivinskiy S.S. 28

Integral characterization of electrical machines with electromagnetic field theory methods

An asynchronous motor and a synchronous generator are used as examples to introduce techniques and algorithms of electromagnetic field theory method based calculation of integral characteristics of electrical machines. Direct field analysis is shown to allow improvement of mathematical simulation veracity for electrical machine characterization.

Key words – **integral characteristics, electrical machine, electromagnetic field theory methods, direct field analysis, calculation.**

Matusevich V.A., Getya A.N., Sharaban Yu.V. 33

Application of high-coercitivity permanent magnets in aircraft units.

In the article, aircraft units in which permanent magnets are applied are considered. Operation conditions for the units and the permanent magnets are given. Technical requirements to materials of the permanent magnets are specified subject to their particular applications in aeronautical equipment.

Key words – **permanent magnet, brushless motor, aircraft unit, pump, electromechanical actuator.**

Mishin V.I., Chuenko R.N., Kulinich A.N. 36

Principle of compensated induction motor characteristics calculation in asymmetric modes.

A technique and principle of asymmetric operation conditions calculation for a compensated induction motor operation are considered for comparative characterization with a commercial squirrel-cage induction motor.

Key words – **compensated induction motor, characteristic, asymmetric operation conditions, calculation technique.**

Popovich A.M., Golovan I.V. 42

A mathematical model for calculation of starting characteristics of induction motors allowing for equivalent loss contours in the stator and rotor steel.

A mathematical model of an induction motor that takes into account equivalent eddy-current loss contours in the stator and rotor steel is elaborated.

The model is intended for construction of starting characteristics of induction motors with the rotor's frequency dependent parameters.

Key words – **induction motor, starting characteristics, eddy-current losses in steel.**

On optimization of three-phase and three-phase –two-phase multiwinding transformers and autotransformers.

The paper presents the basic approaches for development of an optimization model of three-phase and three-phase – two-phase transformers and autotransformers of current harmonics suppressors. An introduced pilot model allows designing weight-, volume- and cost-optimum multiwinding transformers and autotransformers. The material given will be useful to experts in the field of electromechanics, electrical networks and transforming engineering.

Key words – **three-phase and three-phase – two-phase transformers and autotransformers, optimization, current harmonics suppressor, optimization model.**

Radial forces in switched reluctance motors.

Results of calculation of radial forces resulting from rotor eccentricity in two variants of a 4-phase switched reluctance motor (SRM) with the number of poles 8/6 and 16/12 are given. It is shown that SRM design with the number of poles 16/12 is preferable by a minimum radial forces criterion.

Key words – **switched reluctance motor, magnetic field, electromagnetic forces, rotor eccentricity.**

Additional losses in a turbogenerator rotor under long-time unbalanced load.

2D FEM computer simulation of electromagnetic processes in a 300 MW synchronous turbogenerator rotor under long-time unbalanced load is carried out. Effect of slot wedge material on additional losses in rotor with neglect of contact phenomena is studied. It is demonstrated that utilization of titanium wedges is preferable in comparison with duralumin ones.

Key words – **turbogenerator rotor, wedge, negative-sequence currents, electromagnetic field, current density, additional losses, finite element method.**

Electrical Engineering: Theory

Features of conformal mapping of external region of a bipolar system of symmetric C-type poles.

It is shown that at conformal mapping of symmetric C-type poles, co-ordinates of correspondingpoints after the mapping can be found via numerical solution of a transcendental equation that is identical in notation for symmetric points.

Key words – **conformal mapping, bipolar system, symmetric C-type poles, transcendental equation.**

The state-of-the-art and problems of development of electric circuit theory as a part of physics.

The paper analyses the state-of-the-art of general electric circuit theory in comparison with physics and mathematics and formulates problems and prospects of development of the electric circuit theory as a part of physics.

Key words – **electric circuit theory, state-of-the-art, development.**

Universal approximation of magnetization curves for electrical steels.

A new universal approximation of magnetization curves for electrical steels is proposed in the form of a smooth curve within the whole range of magnetic field strength variation. The approximation is easy to use in analytical applications and allows high-accuracy reproduction of the magnetization curves.

Key words – **magnetization curve, electrical steel, approximation.**

High Electrical and Magnetic Field Engineering

Experimental determination of reliability indices of paper-castor-insulated capacitor sections.

Results of longevity testing of high-voltage impulse capacitor sections with paper-castor dielectric are given. Mean life and standard deviation for normal logarithmic failure distribution are found as function of the dielectric thickness.

Key words – **high-voltage impulse capacitor, paper-castor dielectric, longevity test, reliability indices.**

Estimation of discharge voltage through insulator leakage currents under operating voltage.

The paper presents a technique for substation insulation strength determination based on a derived functional relationship between the insulator leakage current and its discharge voltage.

Key words – **insulation, leakage current, discharge voltage.**