Free transverse vibrations of orthotropic visco-elastic rectangular plate with continuously varying thickness and density

Arun K. Gupta, Neeri Agarwal, Sanjay Kumar

Abstract. An analysis of free transverse vibration of a non-homogeneous visco-elastic orthotropic rectangular plate with continuously varying thickness and density is presented. The governing differential equation of motion for free vibration is obtained by the method of separation of variables. The variation in density is assumed exponential in the x-direction, which increases non-homogeneity in plate material and makes the problem interesting because the assumption of changing density of the plate extends the spectrum of practical tasks in comparison to a uniform density, i.e., homogenous plate. For the visco-elastic case, the basic elastic and viscous elements are combined. The Kelvin model for visco-elasticity that is a combination of the elastic and viscous elements in parallel is taken. Here the elastic element means the spring and the viscous element means the dashpot. The governing differential equation of motion is solved by the Galerkin technique. Deflections, time periods and logarithmic decrements corresponding to the first two modes of vibrations of a non-homogeneous visco-elastic orthotropic rectangular plate for various values of taper constant, non-homogeneity constants, and aspect ratio are obtained and shown in a tabular form.

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Design of a miniaturized proximity-coupled microstrip antenna for 5 GHz band wireless communication

Milind Thomas, Jibendu S. Roy, Bhaskar Gupta

Abstract. Investigations on an inclined-slot loaded proximity-coupled microstrip antenna are reported. The antenna has very small size, wide bandwidth and moderate gain and may be used as a small, compact antenna for 5 GHz band wireless communication. The antenna is designed using IE3D software, and the results are verified by measurement. Some of the parametric studies are reported.

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Observers for an elastic two-mass system

Želmíra Ferková, Ladislav Zboray

Abstract. An analytical model used for fault detection of a two-mass drive with elastic mechanism is investigated. An observer with unknown input needs measurement of the elastic torque. A modified scheme can exclude influence of the elastic element. The Luenberger state observer completed with off-line parameter identification by a genetic algorithm enables periodical checking of the elastic parameter. Time responses obtained during the simulation verify the introduced considerations.

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Novel algorithm for control of a shunt active power filter based on a three-level voltage source inverter

S. Rajashekhar, K. P. Vittal

Abstract. A three-level voltage source inverter is utilized to implement a shunt active power filter. SVPWM technique is used in the control circuit to generate the required gate pulses for the voltage source inverter. Principle of operation and analysis of the control circuit is presented. The proposed control algorithm ensures balance of dc bus voltages. Hence this active power filter is ideally suited for high power drives and transmission systems. The simulation results are presented and analyzed. The THD of load current is reduced to 6.47 % from 28.795 % in steady operation.

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AC motors and generators with six-phase stator windings

Jakub Bernatt

Abstract. Various patterns of armature windings (3-phase or 6-phase) of electric induction motors and generators are evaluated with respect to increasing motor parameters and diminishing costs of frequency converter. The advantages of nonsymmetric phase spatial distribution of 6-phase winding are shown. Calculated space harmonics of magnetmotive force (MMF). Performing of lab tests of 50 kW 3-phase and 6-phase motors. Elimination of 3rd, 5th, 7th spatial harmonics of MMF in motors and generators. It causes increasing the efficiency of 50 kW motor by 0.4 %. Design and manufacturing of motors of large output (> 1000 kW) for inverter fed and low voltage (< 100 V) medium output motors (especially permanent magnet motors) due to easier winding coil manufacturing, as well as better parameters of ready made machines. Clearly showing advantages of 6-phase machines confirmed by results of lab tests.

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Algorithms for estimation of model parameters of excitation system of an electrical machine

Łukasz Majka, Stefan Paszek

Abstract. Estimation of parameters of mathematical model of an electromachine excitation system is presented, carried out by selected optimisation algorithms. The estimation is based on real and simulated measurement of waveforms obtained during test disturbances of the steady-state operation of the generating unit. Measurements of dynamic waveforms during step changes in the reference voltage of the voltage regulator of the generator operating in no-load state at the voltage controller operation (automatic control) were taken and recorded in Power Plant Rybnik. The problem of determining the considered model parameters is formulated in the form of the objective function, which was minimised using genetic, gradient and hybrid algorithms. MATLAB-Simulink package was used for computations.

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Infinite boundary element application in optical mammography

Maciej Pańczyk, Jan Sikora

Abstract. An improved methodology for early detection or screening examination of breast cancer is presented. The enhanced models based on boundary element method use an extension of the definition area to other tissues surrounding the breast. Several versions of such models are considered, among them a model containing infinite elements. The results are compared and discussed.

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Influence of thermal radiation on heat transfer in electrical equipment

Rainer Haller, Jiří Kožený

Abstract. Important aspects of heat transfer in electrical equipment are investigated. Based on fundamental relations the heat transfer is calculated on simple (isothermal) arrangements such as cylindrical conductor, vertical plate, and horizontal foil. It is demonstrated that the radiation part of heat transfer is, at least, comparable with the convection part. For the calculation purposes, the thermal network method and the similarity theory are used, and the theoretical results are verified by measurement. In the conclusion, the heat transfer in technical equipment such as bus-bar is investigated. It is confirmed, that taking into consideration the radiation part, the maximal permissible current of equipment and, in the same manner, its current-carrying capacity significantly increase. These results can also be generalized on similar electrical equipment.

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