MECHANICS

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ANALYSIS OF NON-STATIONARY TIME SERIES AN EXAMPLE OF CARDIO SIGNALS

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The cardiosignals of healthy man, patients with hypertrophy, bundle branch block and myocardial infarction are investigated with mathematical methods. The iteration algorithm of cardio complex identification is used for time series segmentation. Based on these segments the time analysis, frequency analysis and detrend fluctuation analysis are carried out. The comparison of the statistical analysis results are presented.

Keywords: *non-stationary time series, segmentation, cardiographic complex, cardiointervalogram, detrend fluctuation analysis, Poincare plot.*

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BUCKLING OF A TWO-LAYERED CIRCULAR PLATE WITH INITIALLY PRE-STRESSED LAYER

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We analyze instability of a uniformly compressed circular two-layered plate with initially compressed or stretched layer. As a constitutive relation of material we use the incompressible neo-Hookean model. We assume that the bottom layer is subjected by radial tension or compression. As a result in this layer there are initial strains and stresses. The two-layered plate is subjected by uniform lateral compression. The stability of the plate we study with the use the static Euler method. We derive the three-dimensional linearized equilibrium equations for each layer. The solutions of the latter equations are obtained with the help of Fourier method. We present analysis of dependence of critical stress resultants on the initial strains and stiffness parameters.

Keywords: *no-nlinear elasticity, buckling, bifurcation of equilibrium, two-layered plate.*

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STUDY OF SHALLOW WATER EQUATIONS ON THE SURFACE OF A FIXED CYLINDER

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The behavior of thin liquid layer of an incompressible ideal fluid can be simulated by the shallow water equations. In the case when the equations are of hyperbolic type, additional simplifying assumptions on the problem parameters allow to construct the Riemann – Green function and construct the solution in implicit form. This function can be represented in the form of some hypergeometric functions that require numerical methods for analyzing solutions. In particular, the results of calculations which describe the effect of some initial perturbations of the velocity field and the behavior of the free surface of the thin liquid layer are presented.

Keywords: *shallow water equations, Riemann – Green function, Riemann invariants.*

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INVESTIGATION OF FLUIDIZED BED DYNAMICS USING OPENFOAM

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The vibrofluidized bed was investigated. The theoretical investigation of vibrofluidization was performed using redistributable package OpenFoam for solution of applied problems of hydro and aerodynamics. Calculations were performed for particles of various diameter. Numerical calculations of volume particle distribution depending on the gas feedrate were presented.

Keywords: *fluidized bed, two-fluid model, kinetic theory of granular gas, OpenFoam, solver twoPhaseEulerFoam.*

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ABOUT APPLICATION OF THE METHOD OF CONFORM REFLECTIONS TO SOLUTION OF THE SPECIFIC PROBLEMS OF FILTRATION

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In this regard a linear-fractional function is developed conformably to the geometry of specific tasks. Obtained potentials describing the trends in a piecewise homogeneous medium with an annular crack of variable width and variable-width semicircular crack in a piecewise-homogeneous medium limited with straight contour of power supply or fault line.

Keywords: *filtration, medium, contour, liquid, rift, massif, oil-bearing, water-bearing, half-plane, stratum.*

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