ABSTRACTS

Adam Adamowicz, Andrzej Seweryn

Prediction of the brittle fracture using higher order terms of the asymptotic expansion

The paper deals with the problems of an applications of analytical element method to modelling of stress fields near the cracks and sharp notches in a elastic bodies. The method of analytical elements is applied to find the classical and the generalized stress intensity factors and the coefficients of the higher terms of the asymptotic solution in the case of sheet containing crack or triangular notches. The derived calculations were used to find critical condition of crack propagation.

Jerzy Bakunowicz, Henryk Kopecki

Stability And Critical States Of Orthotropic Sandwich Structures

The paper presents numerical and experimental researches on stability and critical states of sandwich structures. The problem was solved by means of finite element method, concerning geometrical non-linearity. Numerical results compared to the experiment allowed to make some general statements on the design methodology of such structures

Marcin Cegielski, Artur Ganczarski

Effect of continuous damage deactivation on yield and failure surfaces

This article deals with the modeling of the continuous damage deactivation affected yield surfaces of copper and failure surfaces of mortar, from the viewpoint of continuum damage mechanics. The concept of damage deactivation is adapted to Tresca-Guest and Huber-Mises surfaces and two models are presented: the classical discontinuous one, in which microcracks close instantaneously, and the new continuous one, in which they close gradually. The results for both models are compared and verified in order to achieve the best fitting the experimental data. Detailed quantitative and qualitative analysis of obtained solutions confirms the necessity and correctness of an application of the continuous damage deactivation concept.

Barbara Kamieńska-Krzowska, Leszek Semotiuk, Marcin Czerw

Analysis of possibility of objective sound application to active checking on FV580A vertical machining centre

The possibility of application of objective sound on CNC metal working machines to selected linear details measurement in the course of tooling process and also after is ending has been analysed. The advantage of this solution is the possibility of measurements execution without attaching change of treatment object. However, the fault of mentioned above solution is the influence of connected factors with the course of cutting on the precision of the measurements executed.
The comparative studies of measurement results obtained on the FV580A vertical machining centre by means of MP10 objective sound with measurements of the same dimensions on the VISTA coordinates measuring machine have been executed. The results of this measurements show some divergences and they depend from the measured dimension. Their precise analysis permits to state that the application of MP10 sound to the checking of process course of tooling is legitimate with respect on the needs of rapid diagnostic of the treatment object dimension and can be also of the alternative for the measurements executed on the coordinates machines.

Andrzej Kazberuk

Stress concentration around oval hole

In the paper the application of the unified approach method to solve problems of stress concentration around sharp and rounded oval hole in elastic plane was presented. The stress field distribution was obtained for various vertex angles and curvature radii using singular integral equation method. The method based on passage to the limit (when curvature radius tends to zero), was used to obtain stress intensity factor at the vertex of sharp lens hole in a plane under tension. Accuracy of the new method was analyzed by comparing numerical results of stress intensity factors to well known analytical solution. The approximation formulas for estimation of stress intensity and concentration factors were presented.

Tomasz Kopecki

Thin-walled structures design problems, considering advanced, post-buckling deformations

Paper presents the results of experimental investigations and numerical analysis, of thin-walled, open section, cylindrical shells, subjected to constrained torsion. Analysed structures were the copies of isolated, aircraft structures' parts, corresponding to large cutouts. The experiment concerned three versions of models, with different number of reinforcing stringers. Forms of post-critical deformations and representative equilibrium paths, were obtained. Results of experimental research were a base for nonlinear finite elements analysis. Obtained forms of post-critical deformations and equilibrium paths were compared. A number of conclusions and instructions for design of similar bodys, were formulated.

Adam Mazurkiewicz, Tomasz Topoliński

The estimation of changes calculated fem values young's modulus of trabecular bone in function simplifying of modelling of bone

It the paper presented results of measurement of Young's modulus trabecular bone collected from heads of human femoral bone. The results obtained from compression test and calculation FEM. Geometrical models of samples trabecular bone about different exactitude were built on the base μCT measurement and used to calculations. On the base results of compression test and calculations FEM of models were proposed the minimum resolution of Mct investigation, necessary to receipt in investigation in vivo information about structure of trabecular bone from heads of human femoral bone.

Marek Romanowicz, Andrzej Seweryn

Fracture of wood under biaxial loading condition

A new approach to solving fracture problems of wood was presented. The presented approach made use of concepts of a critical plane and the non-local stress fracture criterion, which were extended to study of fracture phenomenon of orthotropic materials, like wood. In order to evaluate of the validity of the derived non-local fracture criterion of wood, a experimental investigation of the mixed mode fracture toughness of pine wood was made. Experiments have been carried out using specimens with single-edge crack. Crack was notched both along the main orthotropy axis and with some inclinations to the main orthotropy axis. The mixed mode conditions were controlled by varying of the quotient between the stress intensity factors associated with mode I and mode II.

Mykhaylo P. Savruk, Andrzej Kazberuk
Stress intensity factors for diamond-shaped hole in elastic plane under tension

The unified approach to solve problems of stress concentration around sharp and rounded diamond shaped hole in elastic plane based on singular integral equation method was proposed. At first, the problem was solved for an elastic domain with diamond hole with rounded vertex of large curvature. The method based on passage to the limit (when curvature radius tends to zero), was used to obtain stress intensity factor at the vertex of sharp diamond hole in a plane under tension. The numerical results of stress intensity factors for a diamond hole of arbitrary vertex angle were discussed.

Mykhaylo P. Savruk, Adam Tomczyk, Aleksander Yevtushenko
Plane contact problem for semi-space with crack taking into account friction effect

The paper is concerned on effects produced by moving of punch pressed down to semi-space surface including single crack. Integral equations system represents general problem described by Savruk and Yevtushenko (2005) has been reduced to system of linear algebraic equations. Influence of friction coefficient on contact stress distribution and also dependence of crack angle and distance between crack and punch is discussed.

Jerzy Sładek, Grzegorz Sokal, Ksenia Ostrowska, Artur Kmita
Calibration of coordinate measuring arms

When the frequency of assortments changes is very high, the increase of requirements concerning the quality of production creates good conditions for the application of universal measuring tools, such as coordinate systems. The application of systems with rotary kinetic couples is caused by the necessity to measure places which are hard to access by classical measuring machines. Industrial robots adjusted to measuring tasks, and coordinate measuring arms in particular (CMA), are one of the most commonly applied systems. Planning on the application of these type of devices, their accuracy should be analyzed in the conditions of testing length measurement. This article proposes the application of norms and offers recommendations concerning the control and calibration of coordinate measuring machines for CMA calibration tasks. The conducted calibration WRP with use of a ball plate was the starting point for describing the space of Maximum Permissible Errors (MPE) and the uncertainty of assignation of the indication error. Keywords: calibration, MPEP, MPEE, 3D measuring arm, measurement uncertainty.

Borys Storch, Izabela Wierucka
Optical Measurements of Repeatable Contours Using the Image Processing Techniques

Currently, many methods are used to determine the functional parameters of the objects with repeatable contours (e.g. thread parameters). The authors tested the thread parameters measured in the reflected and passing light through optimization of the light source parameters. To perform 2D optical measurement of the thread with use of a microscope and CCD camera, various measuring methods were developed. The tested surface points of the object are optically registered and their data are transmitted to a PC and relevant functional object parameters are calculated using specially designed algorithms of image processing. It is possible to determine the contour parameters as well as important thread parameters with specific measurement accuracy. The methods based on the Fourier Transform as well as on the Spectral Power Density were applied, but the authors developed also some own methods.

Heorhij Sułym, Mikolay Mahorkin
Asymptotic distribution of stresses, displacements and potential deformation energy in the vicinity of corner point in multiwedge elastic body

The asymptotic distribution of stresses, displacements and strain potential energy in the vicinity of corner point in a multi-wedge system under antiplane strain has been studied. As an example we have constructed the asymptotic presentation of stresses and displacements near the top in a two- and three- wedge system. The order of stress singularity and the level of strain potential energy have been investigated numerically

Jarosław Szusta, Andrzej Seweryn
Strain-based damage accumulation model for low cycle fatigue

The paper presents the description of damage accumulation for analysis of fatigue life of structural elements under nonproportional loading states. The numerical algorithm consists of two calculation blocks. First presents method for calculation components of stress and strain tensors using multisurface hardening rule proposed by Mróz. Those components have been used for calculation of fatigue life in second block. Increment of damage accumulation has been addicted from increment of shear strain on physical plane.

Aleksander Yevtushenko, Michał Kuciej
Non-stationary thermal problem in frictional elements

The analytical solution of a boundary-value problem of heat conductivity and corresponding boundary problem of thermoelasticity for tribosystem, consisting of semi-infinity substrate and sliding on its surface a layer is obtained. For materials of frictional pair aluminum-steel it is studied evolution and distribution on depth from a surface of friction of temperatures, thermal fluxes and thermoelastic displacements.

Anna Zawada-Tomkiewicz
Machined surface image analysis for the estimation of this surface parameters

Machined surface image analysis is presented in the paper. The selected methods were analysed for the description of images acquired after the process of turning. Profile and area methods were distinguished. The Optimal Brain Surgeon Method was applied for the selection of the set of parameters which were the most useful in the estimation of surface roughness Ra parameter.