THE THEORY OF OPTIMAL BALANCING OF MECHANISMS

SUMMARY

This book is intended to be useful first of all for the students of doctoral schools and all specialists from the field of mechanism and machine theory, who will deepen their knowledge in the field of dynamical balancing of plain and spatial mechanisms.

The chapters of this book are ordered in the logical succession of theoretical knowledge, followed by the mathematical models. These form the ground of all programs written for the computing of the necessary parameters used in the process of optimal balancing. The practice of the theories presented could be possible with the development of numerical computing methods.

Chapter 1 contains all notations and formulae used in the next, the theory of matrix transformation, followed by the computing of the small vibration amplitudes.

Chapter 2 presents the constraint equation of the joints, with the use of matrix transformation, written by successive rotations about axes OX and OY. This is done for all particular cases in order to obtain the positions of all elements of the mechanism.

Chapter 3 contains the constraint equations of the velocities. They are treated in case of superposition of the axes $O_{ij}^{*}x_{i}^{*}$ and $O_{ji}^{*}x_{j}^{*}$ respectively $O_{ij}^{*}y_{i}^{*}$ and $O_{ji}^{*}y_{j}^{*}$, considered for the relative position of the joined elements „i” and „j”.

Chapter 4 describes the constraint equation of the accelerations, in the superposition hypothesis of the axis identical to those presented in the previous chapter.

Chapter 5 presents the constraint equations for the positions, velocities and accelerations. It is performed admitting the hypothesis of superposition of rotation axes $O_{ij}^{*}z_{i}^{*}$ and $O_{ji}^{*}z_{j}^{*}$. The calculus here is based on Euler’s angles.

Chapter 6 deals with the balancing possibilities of the inertial forces and their moments, about the three perpendicular axes of balancing. There are discussed also the partial balancing possibilities, considering only one or two balancing axes. Here, the optimum balance is defined as the setting that minimizes the perturbing forces and moments. It is followed by the model of minimizing the amplitude of the vibrations in a single point of the machine body, respectively in a finite number of body points.