In particular, a decomposition theorem which gives the conditions for the state-determined, causal, representation of a system is presented, with its application in dynamical systems theory and automata theory.

(9) Mathematical theory of multi-level systems — M.D. Mesarović

A control (or decision-making) system which consists of a family of hierarchically arranged control subsystems is termed a multi-level system. It has been shown that many complex industrial, biological and organizational systems can be modelled mathematically in such a way.

A central problem in the theory of multi-level systems is the interrelationship between levels, and in particular exchange of information and decisions. To develop a mathematical theory of interlevel relationship the simplest type of multi-level system, namely a two-level system with a single unit on the first level, has been considered; the decision problem of the second level unit in such a system is termed co-ordination.

A mathematical theory of co-ordination for systems described in Banach spaces is presented. Theorems giving necessary and sufficient conditions for optimal co-ordination of abstract dynamical systems are presented and their application to systems described by differential equations is discussed.

(10) Geometric elements in the theory of transformations of ordinary second-order linear differential equations

O. Borůvka

The basic problem in the theory of transformations of second-order linear differential equations formulated by Kummer in 1834 is the following:

Given two such equations (1) $y'' = q(t)y$, (2) $Y'' = Q(T)Y$