

A Criterion for the Existence of Nondestructive Controls in the Problem of Optimal Exploitation of a Binary-Structured System

VI. D. Mazurov^{1,*} and A. I. Smirnov^{1,**}

Received June 11, 2020; revised July 20, 2020; accepted July 24, 2020

Abstract—Earlier the authors proved the equivalence of a sustainable exploitation problem for a system of renewable resources and a certain mathematical program. In this paper we study the properties of a map describing the dependence of the state vector of the system on the control. In the particular case of a structured population described by the binary Leslie model, conditions for the objective function are characterized under which there are optimal controls preserving all structural divisions of the system. In this case, we use the notion of local irreducibility, which generalizes the classical notion of map irreducibility.

Keywords: optimal exploitation of ecosystems, nondestructive controls, irreducible map, concave programming.

DOI: 10.1134/S008154382106016X

¹Krasovskii Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences, Yekaterinburg, 620108 Russia
e-mail: *mazurov@imm.uran.ru, **asmi@imm.uran.ru