

On the solution of the optimal control problem of inventory of a discrete product in stochastic model of regeneration

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Abstract: On the Solution of the Optimal Control Problem of Inventory of a Discrete Product in Stochastic Model of Regeneration The work considers a new model of discrete product inventory control in regeneration scheme with a Poisson flow of customer requirements, random delivery delay and deferred demand. The control parameter r is the level of the stock, at which achievement it is necessary to make an order for replenishment, and this parameter is determined in accordance with a discrete probability distribution, which plays the role of a control strategy. As an indicator of control efficiency, we consider the average specific profit obtained during the re-generation period. In order to obtain an explicit representation for this indicator, a special version of the classical ergodic theorem was proved for the additive cost functional. The optimal control problem is solved on the basis of the statement about the extremum of a fractional-linear integral functional on the set of discrete probability distributions. Explicit representations are derived for the mathematical expectations of the increments of the profit functional on the regeneration period under all possible conditions on the control parameter. These analytical representations enable us to explicitly obtain the stationary cost indicator of control efficiency as a function of the control parameter and, for given model characteristics, numerically determine the optimal value of the control, which contributes to solving one of the important applied problems of the modern economy.

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