# Necessary and Sufficient Conditions for Stabilization of Expanding Systems Servomechanism Problems.

Dibyendu Baksi; Kanti B. Datta; Goshaidas Ray

*Abstract*: The problem of designing realistic decentralized controller to solve a servomechanism problem in the framework of "large scale systems" is considered in this paper. As any large scale system is built by expanding construction of one subsystem being connected to the existing system. In particular, it is desired to find a local stabilizing controller in terms of a free parameter (belonging to the ring of proper stable transfer functions) so that desirable properties of the controlled system, such as tracking and/or disturbance rejection for any arbitrary deterministic signal along with stabilization of the expanded overall system occur. An algorithm for designing such a free controller parameter is presented. The necessary and sufficient conditions for the existence of solutions to the Expanding Systems with Tracking and/or Disturbance Rejection Problem are established here and characterized the corresponding full set of stabilizing controllers that solve the problem. A numerical example is presented to illustrate the design procedure of the proposed controller for the Expanded System.