

Phase Transition in Renewal Systems with Common Reserve

Gurami Sh. Tsitsiashvili

*Institute for Applied Mathematics, Far Eastern Branch of RAS
Vladivostok 690041 Russia,
E-mail: guram@iam.dvo.ru*

Key words: renewal system, load, unload, under load reserves, phase transition.

Mathematical models of renewal systems with a common reserve have been introduced and analyzed detailed by Gnedenko B.V, Beliaev Yu.K. and Soloviev A.D. Tsitsiashvili G.Sh and Markova N.V. analyzed a phenomenon of a phase transition in the aggregated renewal system with the unload reserve as analytically so numerically. But the mathematical method applied by these authors is too specific to analyze the phase transition phenomenon in general renewal systems with the common reserve.

In this paper a method based on a definition of a state in which a birth and death process describing this system has a maximal limit probability is suggested. This method allows to construct convenient upper bounds of the limit probability for other states and to analyze phase transition phenomenon. The obtained bounds depend on transition intensities of the birth and death processes which describe aggregations of renewal systems with unload, under load and load reserves. The suggested method allows an analyzing of a renewal system with a competition between the repair places also.

Obtained results are generalized onto an aggregated closed queuing network in which a single node is multi server system and all other nodes are one server systems.