# The likelihood function based on uncensored/censored statistical data for Min-PSD(Max-PSD) and Max-PSD(Min-PSD) as lifetime distributions in network reliability

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**Abstract.** In our paper general formulas for the likelihood function are derived in the case when uncensored/censored statistical data refer to the lifetime of serial-parallel and parallel-serial type networks when the lifetimes of the system units are independent, identically distributed random variables and the number of subsystems and the number of units in each subsystem are random variables with power series type distribution. The formulas can be applied to obtain maximum likelihood estimators for the parameters of the lifetime distribution of the mentioned networks. The results are illustrated by examples of concrete probabilistic models.

The problem of obtaining maximum likelihood estimators for the lifetime distribution parameters of serial-parallel and parallel-serial networks described in [1], first requires knowledge of the likelihood function based on both uncensored or uncensored statistical data. Since dynamic probabilistic models have already been launched and researched for the mentioned networks, following which the most general analytical formulas were obtained [2,3], it is natural that they have a similar continuity in the case of the likelihood function.

The general formulas that serve as the source for calculating the Likelihood Function which represents the cumulative distribution functions (c.d.f.) of the lifetimes of the networks, respectively, of serial-parallel type and

parallel-serial type [2,3]. Using them, we show how the Likelihood Function looks both in the case of uncensored data and in the case of censored data according to the methodology described in [4].

Finally, our conclusions are the following:

General formulas for determining c.d.f. of lifetimes is a large source of dynamic probabilistic models for serial-parallel or parallel-serial networks, but also a basis for writing the Likelihood Function, when the data are uncensored or censored. Writing the likelihood function for cenzored data becomes simpler, because it does not depend on the type of lifetime as r.v. (discrete or continuous), using only c.d.f.. The examples given show that finding the maximum likelihood estimators becomes a maximization problem that can be solved, as a rule, by numerical methods, implemented, in particular, in the Mathematica System.

**References**

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