

The deviation matrix, Poisson's equation, and quasi-birth-death processes

Sarah Dendievel *Département d'Informatique, Université Libre de Bruxelles, Belgium*

Guy Latouche *Département d'Informatique, Université Libre de Bruxelles, Belgium,*

Yuanyuan LIU *School of Mathematics, Central South University, China,*

E-mail: liuyy@csu.edu.cn.

Abstract:

We consider Poisson's equation for quasi-birth-and-death processes (QBDs) and we exploit the special transition structure of QBDs to obtain its solutions in two different forms. One is based on a decomposition through first passage times to lower levels, the other is based on a recursive expression for the deviation matrix.

It is interesting to note that a solution of Poisson's equation is closely linked with the central limit theorem and perturbation analysis. We conclude with the PH/M/1 queue as an illustrative example, and we measure the sensitivity of the expected queue size to the initial value.