Some algebraic methods in semi-Markov processes

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This article is concerned with algebraic methods developed for discrete-time semi-Markov processes with countable state space. The results presented here are a generalization of those from Barbu, Boussemart, and Limnios (2004), summarized also in Barbu and Limnios (2008), where the basic object analyzed was a finite state space semi-Markov chain. After a short presentation of infinite matrices and associated operations, we describe the discrete-time semi-Markov setting. Afterwards, we present some elements of Markov renewal theory, and we apply these results for obtaining mean hitting times of such a process. Possible fields of application of such models are reliability, survival analysis, queueing systems, finance or insurance.