1144-60-307 **Chon In Luk*** (cluk@cpp.edu), **John Kath**, **Yoseph Dawit**, **Mark Dela**, **Christine Hoogendyk** and **David Perez**. *An Eigenvalue Approach for Determining Certain Birth-Death n-step Transition Probabilities.* Preliminary report.

We present examples of birth-death chains and processes whose one-step transition matrix P (or whose infinitesimal rate matrix Q) have explicit formulas for distinct eigenvalues. In particular, we are interested in formulas that scale-up to an arbitrary number of states H. Our examples either have constant (or alternating) birth and death probabilities or rates. We describe our computer programs that solve for the nth power of P or expQt where t is time. One of our examples corresponds to the classical single server queuing system having a finite buffer of H states, M/M/1/H. We also solve for the nth power of P and consider a boundary problem for a general circular birth-death random walk having constant birth and death probabilities. These results for the nth power of P may be viewed as formulas that give us the probability of going from state i to state j in n-steps on birth-death type lattice paths on a cylinder. We conclude with some related results for more general (non birth-death) Markov models. (Received August 29, 2018)