1153-60-336 **Alan Krinik*** (ackrinik@cpp.edu), **Saif A. Aljashamy**, **David Perez**, **Jeffrey Yeh**, **Aaron Kim**, **Jeremy Lin**, **Thuy Vu Dieu Lu**, **Mac Elroyd Fernandez** and **Mark Dela**. *Generalized ballot box problem and finite Markov chains with catastrophe-like transitions.*

We discuss the following two problems:

1. We generalize the traditional ballot box problem of finding the probability that in a two-candidate election that the winner was never behind during the counting of the votes. We assume that voters cast their votes following a finite birth-death chain with constant transition probabilities a, b and c.

2. When certain types of finite birth-death chains are redefined to include generalized catastrophe probabilities, the eigenvalues and transition probability functions of the newly created (non birth-death) Markov chains may be determined.

For each problem, we make use of the Cayley-Hamilton formulation of the kth power of an n x n real matrix, M , that has n distinct eigenvalues. This is also called Sylvester's matrix theorem. We also reference two articles of S. Kouachi concerning eigenvalues of certain tridiagonal matrices. (Received September 01, 2019)