Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

WILLIAM BIRD

MSc (University of Victoria, 2013)
BSc (University of Victoria, 2011)

“Computational Methods for Domination Problems”

Department of Computer Science

Tuesday, September 12, 2017
9:30 A.M.
Engineering and Computer Science Building
Room 468

Supervisory Committee:
Dr. Wendy Myrvold, Department of Computer Science, University of Victoria (Supervisor)
Dr. Venkatesh Srinivasan, Department of Computer Science, UVic (Member)
Dr. Kieka Mynhardt, Department of Mathematics and Statistics, UVic (Outside Member)

External Examiner:
Dr. Stephen Hedetniemi, School of Computing, Clemson University

Chair of Oral Examination:
Dr. Beatriz de Alba-Koch, Department of Hispanic and Italian Studies, UVic
Abstract

For a graph $G$, the *minimum dominating set* problem is to find a minimum size set $S$ of vertices of $G$ such that every vertex is either in $S$ or adjacent to a vertex in the set. The decision version of this problem, which asks whether $G$ has a dominating set of a particular size $k$, is known to be NP-complete. The *queen domination problem* is to find the minimum number of queens which, collectively, can attack every square on an $n \times n$ chess board. The related *border queen problem* is to find such a collection of queens with the added restriction that all queens lie on the outer border of the board. This thesis studies practical exponential time methods for solving domination problems, and presents an experimental comparison of several different algorithms. The developed algorithms are then used to solve several open problems, including cases of the queen domination problem and the border queen problem. In addition, new theoretical upper bounds are presented for the border queen problem for some families of queen graphs.