Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (University of Prince Edward Island, 2012)
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“New Results on Broadcast Domination and Multipacking”

Department of Mathematics and Statistics

Friday, June 26, 2015
10:30 A.M.
David Turpin Building
Room A144

Supervisory Committee:
Dr. Gary MacGillivray, Department of Mathematics and Statistics, University of Victoria
(Co-Supervisor)
Dr. Richard Brewster, Department of Mathematics and Statistics, UVic (Co-Supervisor)

External Examiner:
Dr. Shannon Fitzpatrick, Department of Mathematics and Statistics, University of Prince Edward Island

Chair of Oral Examination:
Dr. Falk Herwig, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Let $G = (V; E)$ be a graph and $f$ be a function such that $f : V \rightarrow \{0, 1, 2, \ldots, \text{diam}(G)\}$. Let $V_f^+ = \{v : f(v) > 0\}$. If for every vertex $v \not\in V_f^+$ there exists a vertex $w \not\in V_f^+$ such that $d(v, w) \leq f(w)$ then $f$ is called a dominating broadcast of $G$. The quantity $\sum_{v \in V} f(v)$ is called the cost of the broadcast. The minimum cost of a dominating broadcast is called the broadcast domination number of $G$, and is denoted by $\gamma_b(G)$. A subset $S \subseteq V$ is a multipacking if for every $v \in V$ and for every $1 \leq k \leq \text{rad}(G)$, $|N_k[v] \cap S| \leq k$. The multipacking number of $G$ is the maximum cardinality of a multipacking of $G$, and is denoted by $mp(G)$.

In the first part of the thesis, we describe how linear programming can be used to give a $O(n^3)$ algorithm to find the broadcast domination number and multipacking number of strongly chordal graphs. Next, we restrict attention to trees, and describe linear time algorithms to compute these numbers. Finally, we introduce k-broadcast domination and k-multipacking, develop the basic theory and give a bound for the 2-broadcast domination number of a tree in terms of its order.