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

of

KURTIS MANKE

BSc (Thompson Rivers University, 2017)

“Generating function approach for the effective degree SIR Model”

Department of Mathematics and Statistics

Thursday, December 10, 2020
2:00 P.M.
Conducted Remotely

Supervisory Committee:
Dr. Junling Ma, Department of Mathematics and Statistics, University of Victoria (Co-Supervisor)
Dr. Slim Ibrahim, Department of Mathematics and Statistics, UVic (Co-Supervisor)

External Examiner:
Dr. Hao Wang, Department of Mathematical and Statistical Sciences, University of Alberta

Chair of Oral Examination:
Dr. Timothy Iles, Department of Pacific and Asian Studies, UVic

Dr. Stephen Evans, Acting Dean, Faculty of Graduate Studies
Abstract
The effective degree model has been applied to both SIR and SIS type diseases (those which confer permanent immunity and those which do not, respectively) with great success. The original model considers a large system of ODEs to keep track of the number of infected and susceptible neighbours of an individual. In this thesis, we use a generating function approach on the SIR effective degree model to transform the system of ODEs into a single PDE. This has the advantage of allowing the consideration of infinite networks. We derive existence and uniqueness of solutions to the PDE. Furthermore, we show that the linear stability of the PDE is governed by the same disease threshold derived by the ODE model, and we also show the nonlinear instability of the PDE agrees with the same disease threshold.