



DEPARTMENT OF  
**MATHEMATICS  
AND STATISTICS**

## **THESIS DEFENSE**

**Candidate:** Ali Hasan Ali

**Title:** Modifying Some Iterative Methods for Solving Quadratic Eigenvalue Problems

**Date:** Wednesday, December 13, 2017

**Room/Time:** 3:00 p.m. Room 202 MM

**Thesis Advisor:** Dr. Sara Pollock

### **ABSTRACT:**

In this thesis, we are investigating the solutions  $\lambda$  of a typical quadratic eigenvalue problem (QEP). Indeed, solutions  $\lambda$  of a QEP of the form  $Q(\lambda) = \lambda^2 M + \lambda D + S$  that satisfy  $Q(\lambda) = 0$ , can be obtained iteratively and without linearizing the problem. However, many iterative methods can only find some of the solutions  $\lambda$ . Therefore, we are going to modify a method based on Newton iterations in order to find all of the solutions  $\lambda$ , that are known also as the eigenvalues of the QEP. In addition, we will investigate how the proposed method compares with standard iterative methods from the literature. Moreover, we will provide a method for finding an upper bound for the number of the eigenvalues of the QEP, and apply this in our method for the purpose of finding all solutions  $\lambda$ .