Determination of Stress Intensity Factor for Different Crack Sizes using Finite Element Method

Abstract
This Thesis overviews the methods for calculating the stress intensity factor and employs the stress and displacement methods in the current study. The model used simulates a cracked rectangular plate which is subjected to tensile stress. The Finite element method is used to calculate inplane displacement due to applied loads. As a post processing the stress and stress intensity factor over the plate was calculated. The results show that the singularity exists at the crack tip and the components of stress $\sigma_{xx}$ and $\sigma_{yy}$ approach infinity as the crack tip approach $0$. The comparison of the current study to theoretical and other numerical results shows a good agreement and reliability of the program.

The thesis consists of five chapters, the first chapter, presents general overview and historical review. The second chapter demonstrates the theoretical basis in fracture mechanics. The third chapter involves the numerical solution using F.E.M. The fourth chapter demonstrates a case study and the results and discussion of the obtained results. The fifth chapter concludes the work and gives recommendations.