MODE OF FAILURE ANALYSIS OF FIBER REINFORCED COMPOSITE PLATE

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ABSTRACT

This thesis is aimed to analyse the mode of failure of selected fiber reinforced composite plates under transverse loading. A mathematical model and computational model are presented for the analysis. Higher Order Shear Deformation plate theory is utilised to predict the deformation of the plates. A failure criterion with the existence of coupling terms is employed to predict the failure. A program based on a finite element method is developed using Fotran-90 to determine the lamina stresses. These stresses are then used in the present failure model to determine the Mode of Failure. Finally, the Mode of Failure results for Glass Epoxy composite plates are analysed. The results of the mode of failure analysis have shown that the present failure models could offer a better prediction of failure for any composite laminate. The results could also aid in designing optimum composite laminates.

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INTRODUCTION

1.1   Overview

In composite materials, failure is distinguish by its mode of failure. In fiber reinforced composite plate, failure in one direction of any single layer implies neither total failure of that layer, nor the whole structure load. Therefore, the most common way to deal with the failure of composite plates is by using First Ply Failure and Last Ply Failure [1]. Thus, mode of failure analysis is performed to observe better the progress and the characteristic of the failure. It could offer a comprehensive failure analysis and gives a more significance results in aiding an optimum composite lamination design.

1.2   Objectives

The aims of this project are to analyse the mode of failure of fiber-reinforced composite plate between the First Ply Failure and Last Ply Failure; and also to develop a 2-D and 3-D finite element model of mode of failure analysis of fiber-reinforced laminated glass/epoxy composite plate.