DESIGN OF COMPOSITE MATERIAL THAT PROMOTING IN-PLANE AUXETIC BEHAVIOUR

SYARMIZAR BIN MOHD SAFKI

(2003288618)

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Faculty of Mechanical Engineering

Universiti Teknologi MARA (UITM)

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ABSTRACT

The main purpose of this project is to design the material which promotes auxetic behaviour. Experiments have been conducted to identify the properties of UFC385/POLYESTER unidirectional tape. An analytical model using two-dimensional constitutive equation using Classical Laminate Theory (CLT) has been proposed in order to determine the laminate properties. A composite laminate consists of continuous long carbon fibre unidirectional tape and polyester resin (UFC385/POLYESTER) is used as a model in this study. The auxetic behaviour of a laminate is identified by a negative value of the laminate Poisson's ratio. In contrast to conventional material, an auxetic material expand laterally when stretched and contract laterally when compressed [18].

This study concentrated on in-plane auxetic behaviour. This study has been divided into two parts. The first part will concentrate to the experimental determination of strength and stiffness of unidirectional tape. While, the second part is to determine the ply angle combination. On the first part, the properties of unidirectional tape have been identified to further use in second part. The result of second part will be the expected of this study.

Extra works have been done as an extended work due to this study. The results of second part which give the auxetic behaviour have been developed. The purpose of this work is to test this laminate whether it gives the suppose result or not. But for this test, the other student has taken the responsibilities and the result is absolutely positive.

At the end, the objectives of this project have been achieved and the auxetic material can be design using Classical Laminate Theory (CLT) to

UFC385/POLYESTER composite. Here, for UFC385/POLYESTER the negative Poisson's Ratio can be clearly get at combination of angle $[22.5^0, 67.5^0]_S$ and $[67.5^0, 22.5^0]_S$ with value -0.33. The combination of the auxetic occurred at θ_1 equal to 22.5 and 67.5 while θ_2 in range of 50 to 88 and 9 to 41 respectively.

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