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BUCKLING ANALYSIS OF STRINGER STIFFENED COMPOSITE CYLINDER

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ABSTRACT
Buckling, a distinguished word appears in the most failure case of the more sensitive applications such as cylinder. Buckling analysis presents the most important once in which huge helpful information (the failure modes, types of failure, and critical failure load respectively) must be taken in the considerations in the design of any structure. In this paper, buckling analysis was done on stiffened composite cylindrical shell to obtain the critical load and modes of failure under different conditions. The mathematical formulation of the problem was achieved by the ANSYS (Analysis System) finite element program. Effects of some parameters (fiber orientation, skin thickness, and elastic material properties) were studied. A numerical program includes all above features written in APDL (Ansys Parametric Design Language) was achieved.

Keywords: Buckling, Composite Cylinder, Stiffened plate, Strength of Material.

الخلاصة
أنبعاج، كلمة مميزة تظهر في معظم حالات الفشل للتطبيقات الاكثر حساسية مثل الاسطوانة. تحليل الانبعاج يمثل التحليل الاكثر اهمية حيث يظهر معلومات مفيدة جدا (انماط الفشل، انواع الفشل، والحمل الحرج للفشل) والتي يجب ان تأخذ بنظر الاعتبار عند تصميم اي تركيب. في هذا البحث، تم تحليل الانبعاج لرقيقة اسطوانية مصنوعة من مواد مركبة مقواة بالالياف ومزودة بمقويات طولية لايجاد الحمل الحرج للفشل وانماط الفشل تحت ظروف مختلفة. تم التمثيل الرياضي للمسألة بأستخدام طريقة العناصر المحددة والمتمثلة بالبرنامج التحليلي (ANSYS). تمت دراسة بعض المتغيرات (زاوية تدوير الالياف، سمك الغشاء، ومواصفات المادة). تم انجاز اجراء البحث ببرنامج كتب بلغة ال APDL (Ansys Parametric Design Language)

INTRODUCTION
A composite material can be defined as a material that is composed of two or more distinct phases, usually a reinforcing material (filament) supported in compatible matrix, assembled in prescribed amounts to achieve specific physical and chemical properties (Stegmann and Lund, 2001) (1). A basic ply or lamina of a fiber-reinforced composite material can be considered from macro-mechanical point of view as orthotropic material with two principal material directions or natural axis parallel and perpendicular to the direction of the filaments. By bonding these laminas together, a multi-laminas composite called laminate is formed.

Composite materials have a long history of usage. Their beginnings are unknown, but all recorded history contains reference to some forms of composite materials. The procession road in ancient Babylon, one of the most wonders of the ancient world, was made of bitumen reinforced with straw. Straw and horsehair have been used to reinforce mud bricks for at least 5000 years, (Ashby and Jones, 1988) (2).
Structural efficiency is a primary concern in today's aerospace and aircraft industries. This brings about the need for strong and light weight materials. Due to their high specific strength, fiber reinforced polymers find wide application in these areas. Cylindrical structures made of composite material are widely used in the above