Dedication

As far as a tender sky, the bid and the power of the earth as far as I

take my strength from it;

To my Parents.

To the stars that twinkle in the sky;

My Brothers and My Sisters.

for bright candles, that which was still raining information for us;

To Dr: Tariq Al Zaki Moh Al Deen.

For each heart full of freedom, brotherhood and love weaned for all

people. To all of these gave the fruit of my best modest.

Acknowledgement

First, I would like to thank Dr. Tarig Moh Al Deen Al Zaki
who did not spare us for his information at all, and he was the best
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And finally thanks to those who lend a hand in contributing to
research output in this way.

Abstract

In this research solutions of Ordinary Differential Equations are obtained by using Sumudu transform. The research covers vitally important areas regarding Sumudu transform with details.

Chapter one defines Sumudu transform, finds out Sumudu transform for some special functions. Shows how Sumudu transform is connected to Laplace Transform as well as proves some important theorems that widely used Laplace transform.

Chapter two introduces Sumudu transform for derivatives in order to be used later in solving ordinary differential equations. Some examples of boundary value problems also covered in this chapter.

In chapter three the solutions of linear ODEs with constant coefficients is obtained by applying Sumudu transform to them, and some applications.

From the above summary of chapters organization we conclude that Sumudu transform can be regarded a competitor of Laplace transform in solving differential equations.

الخلاصة

هذا البحث تناول حل المعادلات التفاضلية العادية باستخدام تحويل سمودو.

في الباب الاول عرف تحويل سمودو كما تم ايجاد تحويل سمودو لبعض الدوال ووضحت العلاقة بين تحويل سمودو وتحويل لابلاس وايضا تم اثبات بعض النظريات الهامة المستخدمة في هذا التحويل.

وفي الباب الثاني تم تعريف تحويل سمودو للمشتقات للمساعدة في كيفية حل المعادلات التفاضلية العادية وتطرق البحث لحل بعض الامثلة في مسائل ال قيم الحدية.

وفى الباب الثالث تم تطبيق تحويل سمودو لحل انظمة المعادلات التفاضلية العادية الخطية ذات العوامل الثابتة, و بعض التطبيقات.

وأستنتج ان تحويل سمودو ينافس تحويل لابلاس في حل المعادلات التفاضلية.

Introduction

In the literature there are numerous integral transforms and the widely used in physics, astronomy as well as in engineering. The integral transform method is also an efficient method to solve the differential equations. The integral transform was applied to partial differential equations with non-homogenous forcing term and having singular variable data. Recently, Watugala introduced a new transform and named as Sumudu transform which is defined by the following formula

$$F(u) = S[f(t); u] = \frac{1}{u} \int_0^{\infty} \exp(\frac{-t}{u}) f(t) dt, \qquad u \in (-\tau_1, \tau_2)$$

And applied this new transform to the solution of ordinary differential equations and control engineering problems, some fundamental properties of the Sumudu transform were established. This new transform was applied to the one-dimensional neutron equation. In fact one can easily show that there is a strong relationship between Sumudu and Laplace transforms, the Sumudu transform was extended to the distributions and some of there properties were studied.

In this study, our purpose is to show the applicability of this interesting new transform and its efficiency in solving the linear ordinary differential equations with constant coefficients and system of ordinary differential equations.