

GREEN'S FUNCTIONAL CONCEPT FOR A NONLOCAL PROBLEM

Kemal Özen * † Kamil Oruçoğlu * ‡ §

Received 03:07:2012 : Accepted 05:10:2012

Abstract

In this work, by Green's functional concept, in order to obtain Green's solution we concentrate on a new constructive technique by which a linear completely nonhomogeneous nonlocal problem for a second-order loaded differential equation with generally variable coefficients satisfying some general properties such as p -integrability and boundedness is transformed into one and only one integral equation. A system of three integro-algebraic equations called the special adjoint system is obtained for this problem. A solution of this special adjoint system is Green's functional which enables us to determine Green's function and Green's solution for the problem. Two illustrative applications are provided.

Keywords: Green's function; loaded differential equation; nonlocal condition; adjoint problem.

2000 AMS Classification: 35A30, 34B05, 34B10, 34B27

1. Introduction

Some boundary value problems with loaded equations involving local and nonlocal conditions arise in the various areas of mechanics frequently. However, the studies on the ones with nonlocal conditions are fewer than the studies with local conditions in literature. In [5], priori bounds for the stability of solutions to boundary value problems with some loaded equations are obtained. In [8], a boundary value problem for loaded equation involving nonlocal condition is considered in order to obtain the sufficient conditions for Fredholm property.

Green's functions of linear boundary value problems for ordinary differential equations with sufficiently smooth coefficients have been investigated in detail in several studies [11,

*İstanbul Technical University, Department of Mathematics, 34469 Maslak, İstanbul, TURKEY.

†Namık Kemal University, Department of Mathematics, Değirmenaltı Campus, 59030 Değirmenaltı, Tekirdağ, TURKEY. E-Mail: ozenke@itu.edu.tr

‡E-Mail: koruc@itu.edu.tr

§Corresponding author