Positive Solutions of a Second Order m-point BVP on Time Scales

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Abstract: In this study, we are concerned with proving the existence of multiple positive solutions of a general second order nonlinear m-point boundary value problem (m-PBVP)

\[ u^{\Delta\Delta}(t) + a(t)u^{\Delta}(t) + b(t)u(t) + \lambda h(t)f(t, u) = 0, \quad t \in [0, 1], \]

\[ u(\rho(0)) = 0, \quad u(\sigma(1)) = \sum_{i=1}^{m-2} \alpha_i u(\eta_i), \]

on time scales. The proofs are based on the fixed point theorems in a Banach space. We present an example to illustrate how our results work.

Keywords: m-point boundary value problems, positive solutions, fixed point theorems, time scales.


1 Introduction

The theory of dynamic equations on time scales unifies the well-known analogies in the concept of difference equations and differential equations. Some basic definitions and theorems on time scales can be found in the books [3, 4]. In the past few years starting with Il’in and Mossiev [8] and Gupta [6], the existence of positive solutions for nonlinear high-order and second order boundary value problems have been studied by many authors by using the coincidence degree theory and fixed point theorems in cones (see [1, 2, 7, 9, 11, 12, 15] and references therein).

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