Dynamics of Continuous, Discrete and Impulsive Systems Series A: Mathematical Analysis 20 (2013) 695-708 Copyright ©2013 Watam Press

http://www.watam.org

POSITIVE SOLUTIONS OF AN IMPULSIVE SECOND-ORDER BOUNDARY VALUE PROBLEM ON TIME SCALES

Fatma Tokmak and Ilkay Yaslan Karaca

Department of Mathematics Ege University, 35100 Bornova, Izmir, Turkey

Abstract. In this paper, we consider an impulsive second-order boundary value problem on time scales. First, we investigate the sign properties of an associated Green's function. Second, by using fixed point theorem of cone expansion and compression type, we establish the existence of at least two positive solutions. We also give an example to illustrate our results.

Keywords. Green's function, positive solutions, fixed-point theorems, time scales, impulsive boundary value problems.

AMS (MOS) subject classification: 34B18; 39B37; 34N05.

Dynam. Cont. Dis. Ser. A, vol. 20, no. 6, pp. 695-708, 2013.

References

- M. Akhmet, Principles of Discontinuous Dynamical Systems, Springer, New York, 2010.
- [2] F.M. Atici and G.Sh. Guseinov, On Green's functions and positive solutions for boundary value problems on time scales, J. Comput. Appl. Math., 141, (2002) 75-99.
- [3] M. Benchohra, J. Henderson and S. Ntouyas, Impulsive Differential Equations and Inclusions, New York, USA, 2006.
- [4] H. Bereketoglu and A. Huseynov, On positive solutions for a nonlinear boundary value problem with impulse, *Czechoslovak Mathematical Journal*, 56, (2006) 247-265.
- [5] M. Bohner and A. Peterson, Dynamic Equations on Time Scales, An Introduction with Applications, Birkhäuser, 2001.
- [6] M. Bohner and A. Peterson, Advances in Dynamic Equations on Time Scales, Birkhäuser, 2003.
- [7] D.J. Guo and V. Lakshmikantham, Nonlinear Problems in Abstract Cones, Academic Press, Boston, Mass, USA, 1988.
- [8] S. Hilger, Ein Masskettenkalkül mit Anwendug auf Zentrumsmanningfaltigkeiten, PhD Thesis, Universitat Würzburg, 1988.
- [9] L.G. Hu, T.J. Xiao and J. Liang, Positive solutions to singular and delay higherorder differential equations on time scales, *Bound. Value Probl.*, Art. ID 937064, (2009) 19pp.
- [10] L. Hu, Positive solutions to singular third-order three-point boundary value problems on time scales, Math. Comput. Modelling, 51, (2010) 606-615.
- [11] A. Huseynov, Positive solutions of a nonlinear impulsive equation with periodic boundary conditions, Appl. Math. and Comp., 217, (2010) 247-259.
- [12] T. Jankowski and R. Jankowski, Positive solutions to boundary value problems for impulsive second-order differential equations, Dyn. Contin. Discrete Impuls. Syst. Ser. A Math. Anal., 18, (2011) 15-25.
- [13] I.Y. Karaca, On positive solutions for fourth-order boundary value problem with impulse, J. Comput. Appl. Math., 225, (2009) 356-364.
- [14] I.Y. Karaca, On positive solutions for higher-order boundary value problems with impulse, Dynam. Systems Appl., 18, (2009) 687-700.
- [15] R. Luca, Positive solutions for a second-order m-point boundary value problem, Dyn. Contin. Discrete Impuls. Syst. Ser. A Math. Anal., 18, (2011) 161-176.
- [16] A.M. Samoilenko and N.A. Perestyuk, Impulsive Differential Equations, World Scientific, Singapore, 1995.
- [17] H.R. Sun, Y.N. Li, J.J. Nieto and Q. Tang, Existence of solutions for Sturm-Liouville boundary value problem of impulsive differential equations, *Abstr. Appl. Anal.*, Art. ID 707163, (2012) 19 pp.
- [18] Y. Sun, Positive solutions of Sturm-Liouville boundary value problems for singular nonlinear second-order impulsive integro-differential equation in Banach spaces, *Bound. Value Probl.*, **2012:86**, (2012) 18 pp.
- [19] F. Yang, L. Wang and H. Xu, Existence of positive solutions for second order singular impulsive Sturm-Liouville BVP, Nonlinear Funct. Anal. Appl., 15, (2010) 229-245.

Received January 2013; revised October 2013.

email: journal@monotone.uwaterloo.ca

http://monotone.uwaterloo.ca/~journal/

$\mathbf{2}$