

EXISTENCE OF TRIPLE POSITIVE SOLUTIONS FOR A THIRD ORDER GENERALIZED RIGHT FOCAL PROBLEM

ZHANBING BAI AND XIANGLI FEI

Abstract. We obtain sufficient conditions for the existence of at least three positive solutions for the third-order three-point generalized right focal boundary value problem

$$\begin{aligned}x''' &= q(t)f(t, x, x', x''), t_1 \leq t \leq t_3, \\x(t_1) &= x'(t_2) = 0, \quad \eta x(t_3) + \delta x''(t_3) = 0,\end{aligned}$$

where $f : [t_1, t_3] \times [0, \infty) \times \mathbb{R}^2 \rightarrow [0, \infty)$, $q : (t_1, t_3) \rightarrow [0, +\infty)$ are nonnegative continuous functions, $\delta > 0$, $\eta \geq 0$ are constants. This is an application of a new fixed-point theorem introduced by Avery and Peterson [6].

Mathematics subject classification (2000): 34B15.

Key words and phrases: triple positive solutions, focal boundary value problem, fixed-point theorem.

REFERENCES

- [1] R. P. AGARWAL, *Focal Boundary Value Problems for Differential and Difference Equations*, Kluwer Academic, Boston, 1998.
- [2] R. P. AGARWAL, D. O'REGAN, AND P. J. Y. WONG, *Positive Solutions of Differential, Difference, and Integral Equations*, Kluwer Academic Publishers, Boston, 1999.
- [3] D. R. ANDERSON, *Green's function for a third-order generalized right focal problem*, J. Math. Anal. Appl., **288**, (2003) 1–14.
- [4] D. R. ANDERSON, J. M. DAVIS, *Multiple solutions and eigenvalues for third order right focal boundary value problems*, J. Math. Anal. Appl., **267**, (2002) 135–157.
- [5] R. I. AVERY, *A generalization of the Leggett-Williams fixed point theorem*, Math. Sci. Res. Hot-line, **2**, (1998) 9–14.
- [6] R. I. AVERY, A. C. PETERSON, *Three positive fixed points of nonlinear operators on ordered Banach spaces*, Comput. Math. Appl., **42**, (2001) 313–322.
- [7] Z. B. BAI, Y. F. WANG AND W. G. GE, *Triple positive solutions for a class of two-point boundary-value problems*, Electron. J. Differential Equations, **2004**, (6) (2004), 1–8.
- [8] D. GUO, V. LAKSHMIKANTHAM, *Nonlinear Problems in Abstract Cones*, Academic Press, New York, 1988.
- [9] R. W. LEGGETT, L.R. WILLIAMS, *Multiple positive fixed points of nonlinear operators on ordered Banach spaces*, Indiana Univ. Math. J., **28**, (1979) 673–688.
- [10] M. A. KRASNOSEL'SKII, *Positive Solutions of Operator Equations*, Noordhoff, Gronigen, 1964.
- [11] E. ZEIDLER, *Nonlinear Analysis and Its Applications I: Fixed-Point Theorems*, Springer-Verlag, New York, (1993).