Differential
Equations
& Applications
Volume 8, Number 1 (2016), 21–31 doi:10.7153/dea-08-02

POSITIVE SOLUTIONS FOR A FOURTH ORDER DIFFERENTIAL INCLUSION WITH BOUNDARY VALUES

JOHN S. SPRAKER

Abstract. An existence result for positive solutions of a fourth order differential inclusion is proven. This is accomplished by using a certain fixed point theorem on cones and a minor extension of the Ascoli theorem. This inclusion allows both the function and its derivative on the right-hand side.

Mathematics subject classification (2010): 34B18, 34A34, 34A36, 34A60, 34B15, 47H10.
Keywords and phrases: existence of solutions, fourth order differential inclusion, fixed point, boundary value problem, Ascoli theorem.

REFERENCES

[1] R. P. Agarwal, D. O'Regan, *Set valued mappings with applications in nonlinear analysis,* Taylor&Francis 2002.
[2] A. Arara, M. Benchohra, S.K. Ntouyas, A. Ouahab, *Existence results for boundary value problems for fourth-order differential inclusions with nonconvex valued right hand side,* Arch. Math. (Brno), 40 (2004), 219–227.
[3] J.P. Aubin, A. Cellina, *Differential Inclusions,* Springer 1984.
[4] J.P. Aubin, H. Frankowska, *Set-valued analysis,* Birkhäuser, 1990.
[5] R. Avery, J. Henderson, D.O'Regan, *Functional compression-expansion fixed point theorem*, Electron. J. Differ. Equ., **2008** (2008), 1–12.
[6] D.C. Biles, J.S. Spraker, *Existence of positive solutions for a fourth order differential inclusion,* Differ. Equ. Appl., **4** (2012), 539–546.
[7] A. Cernea, *Filippov lemma for a certain differential inclusion of fourth-order,* Bull. Math. Soc. Sci. Math. Roum., Nouv. Ser. 56 (104), No. 2, (2013), 181–189.
[8] L.H. Erbe, S.C. Hu, H.Y. Wang, *Multiple positive solutions of some boundary value problems,* J. Math. Anal. Appl., **184,** (1994), 640–648.
[9] R.Y. Ma, *Multiple positive solutions for a semipositone fourth-order boundary value problem,* Hiroshima Math. J., **33** (2003), 217–227.
[10] R.Y. Ma, J.H. Zhang, M. Fu, *The method of lower and upper solutions for fourth-order two-point boundary value problems,* J. Math. Anal. Appl., 215 (1997), 415–422.
[11] D. Repovs, P.V. Semenov, *Continuous Selections of Multivalued Mappings,* Springer 1998.
[12] M. Svec, *Periodic boundary value problems of a fourth-order differential inclusion,* Arch. Math., (Brno), 33, No. 1-2, (1997), 167–171.
[13] B. Yang, *Positive solutions for a fourth order boundary value problem,* Electron. J. Qual. Theory Differ. Equ., **3** (2005), 1–17.

© ELEMENT, Zagreb
Paper DEA-08-02