SECOND–ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INCLUSIONS WITH A NEW KIND OF INTEGRAL AND MULTI–STRIP BOUNDARY CONDITIONS

BASHIR AHMAD, AHMED ALSAEDI, MONA ALSULAMI AND SOTIRIS K. NTIOUYS

Abstract. In this paper, we study the existence of solutions for nonlinear second-order ordinary differential equations and inclusions with nonlinearity depending upon the unknown function together with its first derivative, supplemented with a new kind of integral and multi-strip boundary conditions. Krasnoselskii fixed point theorem and Banach contraction mapping principle are employed to prove the existence and uniqueness results for the single-valued boundary value problem. In the multi-valued case the nonlinear alternative of Leray-Schauder type is the key tool for studying convex valued right-hand side, while the case of non-convex valued right-hand side is handled with the aid of a fixed point theorem for contractive multivalued maps due to Covitz and Nadler. Examples are constructed for the illustration of the obtained results.


Keywords and phrases: Ordinary differential equations and inclusions, nonlocal, multi-strip, existence, fixed point.

REFERENCES


Third order boundary value problems with nonlocal boundary conditions, Nonlinear Anal. 71 (2009), 1542–1551.


