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TWO POSITIVE SOLUTIONS FOR MULTI-POINT BOUNDARY VALUE PROBLEMS WITH p-LAPLACIAN

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Abstract. *The existence of at least two positive solutions for second order multi-point boundary value problems with p-Laplacian is obtained by utilizing H.Amann fixed point theorem, where the nonlinear term involves the first derivative and may be noncontinuous. The method used in this paper is new.*
Keywords: Cone, Multi-point boundary value problem, Positive solution, H. Amann fixed point theorem

1. **Introduction and Preliminaries.** The boundary value problems with p-Laplacian arise from the study of the p-Laplacian equation, non-Newtonial fluid theory, and the turbulent flow of gas in a porous medium. And these problems have been studied extensively in the literature by using Guo-Krasnoselskii fixed-point theorem, fixed point index theory, upper and lower solutions method, fixed point theorem due to Avery and Peterson and so on; we refer the reader to [1-7] and references cited therein.

Using a fixed point theorem on a cone, Ji et. al. ([11]) investigated the existence of at least one positive solution for the problem

$$(\varphi_p(u'))'(t) + h(t)f(t, u(t), u'(t)) = 0,\ t \in (0, 1), \tag{1}$$

$$u'(0) = 0,\ u(1) = \sum_{i=1}^{m-2} \alpha_i u(\xi_i), \tag{2}$$

where $\varphi_p(s) = |s|^{p-2}s,\ p > 1,\ 0 < \xi_1 < \xi_2 < \cdots < \xi_{m-2} < 1,\ 0 < \alpha_i < 1,\ i = 1, 2, ..., m-2,\ 0 < \sum\limits_{i=1}^{m-2} \alpha_i < 1,\ h(t)$ and $f(t, u, v)$ are continuous.

Using fixed point theorem due to Avery and Peterson, which is a generalization of the Leggett-Williams fixed point theorem, B. Sun et. al. ([8]), H. Feng et. al. ([9]) and Y. Wang et. al. ([10]) studied the existence of at least three positive solutions for the