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EQUIVALENCE THEOREMS AND COINCIDENCE DEGREE FOR MULTIVALUED MAPPINGS

WILSON YOSHIHIRO AKASHI

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Introduction

Let X and Y be normed spaces. The inclusion

$$L(x)\in N(x) \tag{I}$$

where $L: D(L)\subset X\to Y$ is a linear mapping and $N: D(N)\subset X\to CK(Y)$ is a multivalued mapping, has been studied by many authors such as Mawhin (1972); Gaines and Mawhin (1977); Tarafdar and Teo (1979) and others.

Mawhin (1972) and Gaines and Mawhin (1977) consider L a linear Fredholm mapping with index of Fredholm p and N a possibly nonlinear mapping; Tarafdar and Teo (1979) consider L a linear Fredholm mapping with index of Fredholm zero and N a multivalued mapping possibly noncompact. Using an equivalence theorem which reduces the problem of existence of solution of (I) to that of fixed points of an auxiliary mapping and topological degree, they developed a degree called the coincidence degree for the pair (L, N). This coincidence degree has been applied to nonlinear differential inclusions.

The purpose of this work is to develop a coincidence degree for the pair (L, N) where L is a linear Fredholm mapping with index of Fredholm not necessarily zero and N a multivalued mapping that satisfies a weaker condition than used by Tarafdar and Teo.

Using the equivalence theorem of Tarafdar and Teo ([3]-Theorem 3.1) we prove a new equivalence theorem and we build our coincidence degree such that, even when the index of L is strictly positive, this coincidence degree isn't necessarily zero.

The organization of the paper is as follows: in Section 1 we introduce some basic definitions, propositions necessary to the comprehension of the paper; in Section 2 we present algebraic preliminaries and an equivalence theorem; in Sention 3 we present basic assumptions and main results; in Section 4 we present some basic properties of the coincidence degree and in Section 5 we present an application.