THE *P*-IDEAL LINKING CONCEPT IN CRITICAL POINT THEORY. NON EQUIVARIANT CASE

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0. Introduction

Our main objective in this work is to develop the linking concept via the *P*-Ideal Index Theory developed in [6] and to show that that concept is useful in critical point theory. This linking concept is based on the Fadell-Husseini linking concept that was developed in [9]. They have employed the numerical-valued cohomological index theory. More precisely, in this work we first shall announce the *P*-Ideal Valued Cohomological Index Theory. Second, we shall develop the *P*-Ideal linking concept, and some computational examples of *P*-Ideal linking between two sets A and B will be provided. Finally, the *P*-Ideal Linking Concept will be employed in critical point theory in order to obtain a general version of the Li's three critical point theorem.

1. P-Ideal Valued Cohomological Index Theory

The objective of this section is to announce the *P*-Ideal Valued Cohomological Index Theory that was developed by Dos Santos in [6]. Such a theory gives us the flexibility to choose $H^*(E)$-submodule P of $H^*(A)$, where A is a closed subset of our ambient space E, permitting the development of some useful algebraic topological concepts such as *P*-Ideal linking between two sets A and B which will be developed in the next section.

Let E be a paracompact space and $(X, A) \in \mathcal{E}_E$ where $\mathcal{E}_E$ is the category of paracompact pair (X, A) in E for a fixed closed subset A of E. Let $H^*(\ )$ be the Alexander-Spanier cohomology theory with a field coefficient K.

Recall that the cup product defines a multiplication on $H^*(X, A)$ as follows:

$$H^*(X, A) \otimes H^*(E)$$
$$\downarrow\ 1 \otimes i^*$$
$$H^*(X, A) \otimes H^*(X) \to H^*(X, A)$$