Abstract

The main goal of this thesis is to study some existence results of complementarity problems, hemivariational inequalities, inverse variational inequalities and their generalized versions in various space aspects. The existence results of these problems have been developed significantly for their wide range of applications in various disciplines of applied sciences and engineering. The introductory segment of the thesis is affiliated at the beginning. It concisely introduces and delivers an adequate literature survey on complementarity problems, hemivariational and inverse variational inequality problems with their corresponding generalized versions. Then, the thesis devotes to the existence results of the implicit semidefinite and implicit copositive complementarity problems, where the existence results are established through the concept of exceptional family of elements and topological degree. Next, the existence criteria for the system of implicit generalized order complementarity problems are proposed in vector lattices through the concept of order exceptional family of elements and topological degree facet. Further, the existence of solutions for two new classes of hemivariational inequalities are explored in real reflexive Banach spaces, namely, the extended hemivariational-like inequality problems and the variational quasi-mixed hemivariational-like inequality problems. The proposed hemivariational inequalities accommodate several forms of variational and hemivariational inequalities as special cases. Moreover, numerous theoretical applications for the new class of hemivariational inequalities are also illustrated. Apart from this, several kinds of well-posedness notions and their concepts for a general system of mixed hemivariational inequalities and inverse mixed variational inequalities with perturbations are also demonstrated. The metric characterizations of well-posedness are catalogued in terms of the approximating solution sets by using the measure of noncompactness, the diameter of the approximating solutions sets and the generalized Cantor intersection theorem.

Keywords: Implicit semidefinite complementarity problem; Implicit copositive complementarity problem; System of implicit generalized order complementarity problem; Hemivariational-like inequalities; System of mixed hemivariational-like inequalities; Inverse mixed variational inequalities; Coercive conditions; Well-posedness; Perturbations.