Nonlinear Dynamics and Systems Theory, **25** (2) (2025) 171–186

Variational Analysis and Error Estimate of Contact Problem for Thermo-Viscoelastic Bodies with Long-Term Memory

Roufaida Ketfi [1*], Abdelmoumene Djabi [2] and Ilyas Boukaroura [3]

[1] *Laboratory of Applied Mathematics, Faculty of Sciences, University of Ferhat Abbas-Setif 1, Setif 19000, Algeria.*
[2] *Laboratory of Applied Mathematics, Faculty of Economics, Commerce and Management Sciences, University of Ferhat Abbas-Setif 1, Setif 19000, Algeria.*
[3] *Laboratory of Applied Mathematics, Faculty of Sciences, University of Ferhat Abbas-Setif 1, Setif 19000, Algeria.*

Received: August 25, 2024; Revised: March 23, 2025

Abstract: This paper investigates a contact problem involving the quasistatic interaction between two bodies characterized by thermo-viscoelasticity with long-term memory. The mechanical, thermal contact is captured through the sub-differential condition, which represents the frictional interaction. We establish a variational formulation for the model and we prove the existence of a unique weak solution. Subsequently, a numerical investigation is conducted, employing both finite element and finite difference methods. This computational approach allows for the derivation of a discrete approximation of the error associated with the analyzed model.

Keywords: *fixed point; frictional contact; finite element method; thermo-piezoelectric; weak solution.*

Mathematics Subject Classification (2020): Primary 35A15; Secondary 35Q40.

* Corresponding author: mailto:roufaida.ketfi@univ-setif.dz