Preface

Fixed point theory is an important subject of nonlinear analysis, which is still rapidly growing. Indeed, fixed point theory offers an elementary, vigorous and effective tool for nonlinear analysis. It deals with the classical approach to find the exact solution and check the stability of the system. Particularly, metric fixed point theory is a relatively natural part of fixed point theory concerning techniques that involve properties of metrical structure. The first ever metrical fixed point result is due to Polish mathematician Stefen Banach [7] in 1922 and is known as Banach's contraction principle. The theory gained new impetus with the development of nonlinear functional analysis. This result has been generalized and extended to numerous abstract spaces using generalized contractive conditions. Motivated by these generalizations, here we study common fixed point results in the context of G-metric spaces.

This thesis consists of six chapters. Chapter 1 provides a brief introduction to the subject area of the thesis, along with some recent developments in the field. The content of Chapter 2 concerns the study of common fixed point results for cyclic contractions utilizing the notion of (A, B)-weakly increasing mappings in G-metric spaces. Some of the first half of these results are published in *Thai Journal of Mathematics*, (2022), 20(3), 1109-1117. The results of the second half of this chapter are published in *Problemy Analiza-Issues of Analysis*, (2023), 12(3), 119-131. Chapter 3 deals with common fixed point results for Ćirić type contraction via simulation functions in the context of quasi-metric spaces. Further, these results are extended to G-metric spaces. Some of these results are published in *Problemy Analiza-Issues of Analysis*, (2022), 11(2), 72-90. The remaining results have been communicated. In Chapter 4, the common fixed point result for (ψ, ϕ)-Wardowski contraction in the context of G_b-metric spaces is studied. Moreover, its application to neural networks is discussed. The content of this chapter is published in *Acta et Commentationes Universitatis Tartuensis de Mathematica (ACUTM)*, (2023), 27(1), 69-82. Chapter 5 deals with common fixed point results via extended $\Gamma - C_F$-simulation functions. For this, the almost Suzuki type $\mathcal{E}_{(\mathcal{Z},F,\Gamma)}$-contraction in G-metric spaces and Geraghty type contraction in G_b-metric spaces are introduced. The results of this chapter have been communicated. The content of Chapter 6 concerns the study of common fixed point results for weak contraction via generalized $\Gamma - C_F$-simulation functions in the context of G-metric spaces. The results are communicated.