SOLUTION TO SECOND ORDER DIFFERENTIAL EQUATIONS VIA $F_w$-CONTRACTIONS

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Abstract. In this article, we introduce the notions of $F$-contractions and Hardy-Rogers type $F$-contractions via $w$-distances in the backdrop of an orthogonal metric space. After this, we prove some fixed point results concerning the said kind of contractions by taking a weaker version of completeness of the underlying space instead of completeness. Further, we employ the results to obtain some existence and uniqueness criteria of the solution(s) to a certain type of second order initial value and boundary value problems. Along with these, we illustrate some numerical examples to interpret our achieved fixed point results.

Key Words and Phrases: $F$-contractions, $w$-distances, orthogonal metric spaces, second order differential equations.

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References


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