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SOME RESULTS ON NONLINEAR MIXED FRACTIONAL INTEGRODIFFERENTIAL EQUATIONS

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ABSTRACT. In this paper, we study the existence, uniqueness and other properties of solutions for the special class of fractional Volterra Fredholm integrodifferential equation involving Caputo fractional derivative $n-1<\alpha\leq n,\ n>1.$ The result of existence and uniqueness is obtained with help of well known Banach contraction principle and the integral inequality which provides explicit bound on the unknown function. The obtained some results are illustrated through example.

REFERENCES

- S. Abbas, M. Benchohra and G.M. N'Guérékata: Topics in Fractional Differential Equations, Springer New York, NY, 2012 (DM 27).
- [2] R.A. Almeida: A Caputo fractional derivative of a function with respect to another function, Commun. Nonlinear Sci. Numer. Simul., 44(2017), 460-481.
- [3] D. Băleanu, K. Diethelm, E. Scalas and J.J. Trujillo: Fractional Calculus: Models and Numerical Methods, World Scientific Publishing, Boston, Mass, USA, 2012 (SCNC 3).
- [4] K. Diethelm: The Analysis of Fractional Differential Equations: An Application-Oriented Exposition Using Differential Operators of Caputo Type, Springer-Verlag Berlin Heidelberg, 2010.
- [5] K. Diethelm and N.J. Ford: Analysis of fractional differential equations, J. Math. Anal. Appl., 265(2002), No. 2, 229-248.
- [6] K.M. Furati and N. Tatar: Long time behavior for a nonlinear fractional model, J. Math. Anal. Appl., 332(2007), No. 1, 441-454.
- [7] A.A. Kilbas, H.M. Srivastava and J.J. Trujillo: Theory and Applications of Fractional Differential Equations, Elsevier, Amsterdam, 2006 (N-HMS 204).
- [8] K.D. Kucche, J.J. Nieto and V. Venktesh: Theory of nonlinear implicit fractional differential equations, Differ. Equ. Dyn. Syst., 28(2020), 117.
- [9] V. Lakshmikantham, S. Leela and D.J. Vasundhara: Theory of Fractional Dynamic Systems, Cambridge Academic Publishers, Cambridge, 2009.
- [10] B.G. Pachpatte: Inequalities for Differential and Integral Equations, Academic Press, New York, 1998.
- [11] B.G. Pachpatte: On a nonlinear Volterra integrodifferential equation of higher order, Util. Math., 27(1985), 97-109.
- [12] B.G. Pachpatte: Applications of the Leray-Schauder alternative to some Volterra integral and integrodifferential equations, Indian J. Pure Appl. Math., 26(1995), No. 12, 1161-1168.
- [13] B.G. Pachpatte: Global existence and estimates for solutions of certain higher order differential equations, Stud. Univ. Babeş-Bolyai Math., 44(1999), No. 3, 53-66.
- [14] B.G. Pachpatte: On higher order Volterra-Fredholm integrodifferential equation, Fasc. Math., 37(2007), 35-48.

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- [15] B.G. Pachpatte: On iterated Volterra integrodifferential equation of higher oerder, Fasc. Math., **39**(2008), 89-103.
- [16] B.G. Pachpatte: On certain Volterra integral and integrodifferential equations, Facta Univ. Ser. Math. Inform., 23(2008), 1-12.
- [17] I. Podlubny: Fractional Differential Equations, Academic Press, San Diego, 1999.
- [18] S.T. Sutar and K.D. Kucche: Global existence and uniqueness for implicit differential equation of $arbitrary\ order,$ Fract. Differ. Calc., ${\bf 5}(2015),$ No. 2, 199-208.
- [19] H.L. Tidke: Some theorems on fractional semilinear evolution equations, J. Appl. Anal., 18(2012), No. 2, 209-224.
- [20] Y. Zhou, X.H. Shen and L. Zhang: Cauchy problem for fractional evolution equations with Caputo derivative, Eur. Phys. J. Spec. Top., 222(2013), 17491765.
- [21] Y. Zhou: Basic Theory of Fractional Differential Equations, World Scientific, Singapore, 2014.

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