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A New Fuzzy Fractional Order Model of Transmission of Covid-19 With Quarantine Class

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Abstract : This paper is devoted to a study of the fuzzy fractional mathematical model reviewing the transmission dynamics of the infectious disease Covid-19. The proposed dynamical model consists of susceptible, exposed, symptomatic, asymptomatic, quarantine, hospitalized and recovered compartments. In this study, we deal with the fuzzy fractional model defined in Caputo's sense. We show the positivity of state variables that all the state variables that represent different compartments of the model are positive. Using Gronwall inequality, we show that the solution of the model is bounded. Using the notion of the next-generation matrix, we find the basic reproduction number of the model. We demonstrate the local and global stability of the equilibrium point by using the concept of Castillo-Chavez and Lyapunov theory with the Lasalle invariant principle, respectively. We present the results that reveal the existence and uniqueness of the solution of the considered model through the fixed point theorem of Schauder and Banach. Using the fuzzy hybrid Laplace method, we acquire the approximate solution of the proposed model. The results are graphically presented via MATLAB-17.

Keywords : Caputo fractional derivative, existence and uniqueness, gronwall inequality, Lyapunov theory
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