A Class of Third Derivative Four-Step Exponential Fitting Numerical Integrator for Stiff Differential Equations

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Abstract : In this paper, we construct a class of four-step third derivative exponential fitting integrator of order six for the numerical integration of stiff initial-value problems of the type: $y' = f(x,y)$; $y(x_0) = y_0$. The implicit method has free parameters which allow it to be fitted automatically to exponential functions. For the purpose of effective implementation of the proposed method, we adopted the techniques of splitting the method into predictor and corrector schemes. The numerical analysis of the stability of the new method was discussed; the results show that the method is A-stable. Finally, numerical examples are presented, to show the efficiency and accuracy of the new method.