On the Convergence of Solutions of Some Nonlinear Differential Equations of Fourth Order

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Abstract: In this paper, we consider a nonlinear differential equation of fourth order. By the Lyapunov function approach, we discuss the convergence of the solutions of the equation considered. Our findings generalize some well known results in the literature.

Keywords: *convergence of solutions; nonlinear fourth order equation; Routh-Hurwitz interval; Lyapunov functions.*

Mathematics Subject Classification (2010): 34D20, 34C11.

1 Introduction

As we know the qualitative theory refers to the investigation of the behaviors of solutions of differential equations such as the stability, instability, boundedness,convergence of solutions etc. without determining explicit formulas for the solutions.The relative works can be summarized as follows:

In [1, 15, 16], the authors investigated the asymptotic behaviour of the solutions of certain fourth-order differential equations. In [11, 13, 19–25], the authors considered the stability, instability and boundedness properties of the solutions of some nonlinear third, fourth and fifth-order differential equations (see, also, [10, 14]). In [7], Afuwape studied the existence of a limiting regime in the sense of Demidovic for a certain fourth-order nonlinear differential equations. These studies were done using the Lyapunov's second method. In [2,5,8,9], the authors created conditions for the existence of periodic, almost periodic, exponential stability and dissipative solutions by using the frequency domain

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