Stability, Boundedness and Square Integrability of Solutions to Certain Third-Order Vector Differential Equations

D. Beldjerd and M. Remili [*]

Department of Mathematics, University of Oran 1 Ahmed Ben Bella, 31000 Oran, Algeria.

Abstract: In this paper, we establish some new sufficient conditions which guarantee the stability and the boundedness of solutions of certain third order vector differential equations. Sufficient conditions are also established for square integrability of solutions and their derivatives. By this work, we extend and improve some stability and boundedness results in the literature.

Keywords: *Lyapunov functional; third-order vector differential equation; boundedness; stability; square integrability.*

Mathematics Subject Classification (2010): 34C10, 34C11, 34D05, 34D20, 34D40.

1 Introduction

In recent years much attention has been drawn to the stability and boundedness of solutions of ordinary scalar and vector nonlinear differential equations of third order. See Afuwape [1,2],Omeike [9,10] Ezeilo [4,5], Remili [11–14] and the references cited therein for a comprehensive treatment of the subject. Lyapunov's second (direct) method has been used as a basic tool to verify the results established in these works.

In 2009, Tunç [17] proved two results, for the cases P = 0 and P $\neq$ 0, respectively, on the stability and boundedness of solutions to the vector differential equations of third order

$$X'''(t) + \Psi(X'(t))X''(t) + BX'(t) + cX(t) = P(t). \tag{1}$$

---

[*] Corresponding author: `mailto:remilimous@gmail.com`