STABILITY, BOUNDEDENESS AND LAGRANGE STABILITY WITH SEVERAL LYAPUNOV FUNCTIONS IN TERMS OF TWO MEASURES WITH INITIAL TIME DIFFERENCE

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Abstract. We have investigated that the stability criteria of dynamic system by using several Lyapunov functions in terms of two measures with initial time difference. We have applied the several Lyapunov functions in terms of two measures to a obtain the stability, boundedness and Lagrange Stability with several Lyapunov functions in terms of two measures by using two or more Lyapunov-like functions with initial time difference.

Keywords. Initial time difference, Lyapunov's direct methods, several Lyapunov functions, stability, boundedness and Lagrange stability, two measures stability.

AMS (MOS) subject classification: 34D10, 34D99, 34C11.

1   Introduction

Lyapunov function $[1-10]$ has been employed with great success in a wide variety of investigations to understand qualitative and qualitative properties of dynamic systems. We have applied that the several Lyapunov functions to a obtain stability Boundedness and Lagrange Stability with several Lyapunov functions in terms of two measures by using two or more Lyapunov-like functions with initial time difference. We give stability, Boundedness and Lagrange stability for a perturbed differential system with respect to an unperturbed differential system. Hence, we have obtained stability, Boundedness and Lagrange Stability for the general set up of two measures and nonautonomous system with initial time difference.

2   Preliminaries

Consider the differential systems

$$
\begin{array}{rll}
x' & = & f(t,x), x(t_0) = x_0, t \geq t_0 \geq 0, t_0 \in \mathcal{R}_+ \qquad (1) \\
x' & = & f(t,x), x(\tau_0) = w_0, t \geq \tau_0 \geq 0 \qquad (2)
\end{array}
$$