Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **18 (2011)** 191-202

CONVERGENCE OF SOLUTIONS OF A LINEAR IMPULSIVE DIFFERENTIAL EQUATIONS SYSTEM WITH MANY DELAYS

Istvan Győri[1], Fatma Karakoç[2,3] and Hüseyin Bereketoğlu[2]

[1]Department of Mathematics and Computing
University of Pannonia, Veszprem, Hungary

[2]Department of Mathematics, Faculty of Sciences
Ankara University, 06100 Ankara, Turkey

Abstract. Sufficient conditions for convergence of solutions of a nonhomogeneous linear system of impulsive delay differential equations are obtained. Moreover, a limit formula is given.

Keywords. Impulsive delay differential equations system; Bounded solution; Convergence of the solution.

AMS subject classifications: 34K06; 34K45.

1 Introduction

In this paper, we consider the nonhomogeneous linear impulsive delay differential equations system

$$\begin{cases} x'(t) = A_0(t)x(t) + \sum_{l=1}^{L} A_l(t)x(t-\tau_l) + f(t),\ t \geq t_0,\ t \neq \theta_i, & (1a) \\ \Delta x(\theta_i) = B_0(i)x(\theta_i) + \sum_{k=1}^{K} B_k(i)x(\theta_{i-m_k}) + g(i),\ i \in \mathbb{Z}^+ = \{0,1,2,...\}, & (1b) \end{cases}$$

where, $t_0 \geq 0;\ \tau_l > 0$ for $l = 1, 2, ..., L;\ t_0 < \theta_0 < \theta_1 < \theta_2 < ... < \theta_i < ...$ and $\theta_i \to +\infty$ as $i \to +\infty;\ m_k \in \mathbb{Z}^+ - \{0\}$, $\theta_j \in [t_0-\tau, t_0]$ for $j \in \{-m, 1-m, 2-m, ..., -1\}$, $\tau = \max\{\tau_l : l = 1, 2, ..., L\}$, $m = \max\{m_k : k = 1, 2, ..., K\}$; $\Delta x(\theta_i) = x(\theta_i^+) - x(\theta_i^-)$, $x(\theta_i^+) = \lim_{t\to\theta_i^+} x(t)$, $x(\theta_i^-) = \lim_{t\to\theta_i^-} x(t)$. Moreover we assume the following hypotheses:

(H_1) $A_l : [t_0, \infty) \to \mathbb{R}^{n\times n},\ l = 0, 1, 2, ..., L,$ are continuous matrix functions,

(H_2) $f : [t_0, \infty) \to \mathbb{R}^n$ is a continuous vector function,

(H_3) $B_k(i) \in \mathbb{R}^{n\times n}$ for $k = 0, 1, 2, ..., K,\ i \in \mathbb{Z}^+$,

---

[3]Corresponding Author:karakoc@science.ankara.edu.tr. This research has been carried out while the first author was on academic leave, visiting Ankara University. Supported in part by the Scientific and Technical Research Council of Turkey (TUBITAK).