Almost Periodic Solutions for a Class of Nonlinear Duffing System with Time-Varying Coefficients and Stepanov-Almost Periodic Forcing Terms

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Abstract: In this paper, we study the existence of almost periodic solutions for a class of nonlinear Duffing system with time-varying coefficients and Stepanov-almost periodic forcing terms. Some sufficient conditions for the existence and uniqueness of an almost periodic solution of the system are established. We provide an example to illustrate the main result.

Keywords: *nonlinear Duffing system; almost periodic; Stepanov-almost periodic; contraction mapping principle.*

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1 Introduction

In recent years, various kinds of dynamic behaviors of nonlinear Duffing equations have been investigated by many authors due to its applications in many fields such as physics, mechanics, engineering and other scientific fields, for example, see [4, 5, 14]. In such applications, the existence of almost periodic solutions for nonlinear Duffing equations is an important topic. Many authors have studied the existence of periodic and almost periodic solutions of nonlinear differential equations, for more details we refer, [1–3, 6, 9–11, 13, 15–18] and the references cited therein.

Peng and Wang [13] considered the following model for a nonlinear Duffing equation with deviating argument

$$u''(t) + cu'(t) - au(t) + bu^m(t - \phi(t)) = \psi(t), \tag{1}$$

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