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A NOTE ON EXPONENTIAL p- STABILITY OF STOCHASTIC NEUTRAL PARTIAL FUNCTIONAL DIFFERENTIAL EQUATIONS

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Abstract. In this paper, we shall study stochastic neutral partial functional differential equations in real Hilbert spaces. Assuming the existence and uniqueness of a mild solution, our aim here is to study the $p^{th}(p > 2)$-moment exponential stability of a mild solution of such class of equations as well as the almost sure exponential stability of its sample paths. The results obtained here appear to be new and complement the study in [Govindan, Stochastics, 77, (2005) 139-154]. Even in the special case when the neutral term is zero, the results obtained generalize the works [Taniguchi, Stochastic Anal. Appl., 16, (1998) 965-975] and [Liu and Truman, Statist. Probab. Letters, 50, (2000) 273-278]. An example is included to illustrate the theory.

Keywords. Stochastic neutral partial functional differential equations, mild solutions, p^{th}-moment exponential stability, almost sure exponential stability of sample paths

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1 Introduction

In this paper, we study a stochastic neutral partial functional differential equation in a real Hilbert space of the form:

$$d[x(t) + f(t, \pi_t x)] = [Ax(t) + a(t, \pi_t x)]dt + b(t, \pi_t x)dw(t), \quad t > 0; \quad (1)$$

$$x(t) = \varphi(t), \quad t \in [-r, 0] \quad (0 < r < \infty); \quad (2)$$

where $\pi_t x = \{x(t - r + s) : 0 \leq s \leq r\}$ and the problem will be made precise in Section 2. Equation (1) when $f \equiv 0$ has been well-studied, see [4, 9, 16] and the references cited therein. For a motivation of a study on equation (1), we refer to Govindan [2] and to Hernandez and Henriquez [6] in the deterministic case.

The fully nonlinear case, that is, equation (1) when $A \equiv 0$, has also received considerable attention but only in finite dimensions. In fact, Kolmanovskii and Nosov [7] studied existence and uniqueness of solutions of such