Shumafov M. M., Tlyachev V. B. (Adyghe State University, Republic of Adygea, Russia) — **On the stability in the large for two-dimensional nonlinear differential systems perturbed by white noise.**

In the present work, we derive sufficient conditions for stochastically stability in the large of solutions of certain systems of two nonlinear differential equations perturbed by white noise. Our results generalize some results of the paper [1] for stochastic case.

The systems considered are interpreted as systems of stochastic differential equations (SDEs) in the sense of Stratonovich. We formulate one of our results.

Theorem. *Assume that in the system*

$$\dot{x} = f(x) + ay + \sigma(x)\dot{\xi}(t), \quad \dot{y} = bx + g(y), \tag{1}$$

the functions f, g *and* σ *satisfy the Lipschitz condition,* $f \in C^1$, $\sigma \in C^2$, a *and* b *are constants,* $\dot{\xi}(t)$ *is white noise,* $f(0) = g(0) = \sigma(0) = 0$.

Suppose there exist numbers $\delta_i (i = 0, 1, ..., 5)$ *and number* Δ *such that*

1) $c_1(f(x)/x + \delta_4\delta_5/2) - ab > \delta_0$ *for all* $x \neq 0$,
2) $(f(x)/x + \delta_4\delta_5/2) + c_1 < -\delta_1$ *for all* $x \neq 0$,
3) $c_2 g(y)/y - ab > \delta_2$ *for all* $y \neq 0$,
4) $g(y)/y + c_2 < -\delta_3$ *for all* $y \neq 0$,
5) $c_1[f'(x) + (\sigma'^2 + \sigma\sigma'')/2] - ab < \Delta$ *for all* x,
6) $0 < \sigma(x)/x < \delta_4$ *for all* $x \neq 0$,
7) $0 < \sigma'(x) < \delta_5$ *for all* x,
8) $\delta_4^2 < 2\delta_0\delta_1/(c_1^2 + \Delta)$, *where numbers* c_1 *and* c_2 *are chosen such that* $c_1 c_2 = ab$, $ab \neq 0$.

Then the zero solution of the system (1) *is stochastically stable in the large.*

The proof of the theorem is based on the use of Lyapunov-like method of auxiliary functions developed for SDEs [2, 3].

REFERENCES

1. *Krasovskii, N. N.* On stability of solutions of a system of two differential equations. Prikl. Mat. and Meh., 1953, vol. 17, No. 6, pp. 651–672. (In Russian)

2. *Kushner, H.J.* Stochastic stability and Control. N.Y. — London: Academic Press, 1967. 161 p.

3. *Khas'minskii, R.Z.* Stochastic Stability of Differential Equations, 2nd ed. — Heidelberg Dordrecht London New York: Springer, 2012. 339 p.