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Periodic solutions of delay equations with three delays via bi-Hamiltonian systems

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Abstract

In this paper we give sufficient conditions for the existence of periodic solutions of delay differential equations with three delays.

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1. Introduction and the statement of the main results

In 1974, Kaplan and Yorke (see [5]) introduced a new technique to relate a special class of delay differential equations to some ordinary differential systems. The equation they studied is

$$\dot{x}(t) = -f(x(t-1)) - f(x(t-2)). \tag{1}$$

They gave sufficient conditions under which Eq. (1) has a periodic solution of period 6. Later on this method was developed widely, and many results have been established on the existence of periodic solutions of some delay differential equations (see [1–7]). Li and He [6] studied the

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