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Frictional Auto-Oscillations under the Action of Almost Periodic and Periodic Excitations

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The mechanical systems with frictional interaction under the action of both almost periodical and periodical forces are considered in this paper. The systems under the action of almost periodic forces are considered with two independent small parameters. The multiple scales method is used to study bifurcations and chaotic oscillations of these systems. The obtained system of modulation equations contains one small parameter. The Van der Pol method is used to study the bifurcations of modulation equations periodic solutions. The homoclinic Melnikov function is derived to study chaotic solutions of the modulation equations. In the case of the periodical force action and small dissipation a new approach for a construction of homoclinic trajectory of mechanical system is utilized. Also an approach to determine the onset of chaos based on some consequence from the Lyapunov stability definition is suggested for the case when the dissipation is not small.

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