Periodic solutions for certain systems of planar complex polynomial equations

Valentina Taddei

1 Introduction

The present paper deals with the existence of T-periodic solutions of the T-periodic system of complex planar equations

$$\begin{cases} u' = p_1(t,u,v) \\ v' = p_2(t,u,v), \end{cases} \tag{P}$$

where p_1 and p_2 are second order polynomials whose coefficients are T-periodic continuous functions from $\mathbb{R}$ into $\mathbb{C}$.
Like it will be clear from the examples of the last section, (P) represents a generalization of the well known complex periodic Riccati equation

$$u' = u^2 + g(t),$$

where $g : \mathbb{R} \to \mathbb{C}$ is a continuous T-periodic function.

The existence of periodic solutions of equations of the type

$$u' = \sum_{j=0}^{n} c_j(t) u^j \tag{E}$$

is an extensively investigated subject.
For example, in 1973 Lloyd [5] studied the problem when the polynomial at the right hand-side has real-valued coefficients.

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