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SUPPLEMENT TO THE PAPER OF HALIM, TOUAFEK AND ELSAYED: PART I

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Abstract. This work supplements the paper [Closed form solutions of some systems of rational difference equations in terms of Fibonacci numbers, *Dynam. Cont. Dis. Ser. A*, **21**(6) (2014), 473–486.]. That is, an alternative proof – short and elegant – is offered in order to explain theoretically the results presented in the paper which were established through a mere application of the induction principle. Further results regarding the periodicity of solution of the system being examined is also presented.

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1 Introduction

Difference equations are particular forms of what are known as recurrence equations. Linear (homogeneous) types, such as the second-order recursion

$$F_{n+1} = F_n + F_{n-1}, \qquad n \in \mathbb{N}_0 := \mathbb{N} \cup \{0\}$$

which generates the widely studied Fibonacci numbers

$$(F_n)_0^\infty := (F_n)_{n=0}^\infty = \{0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233 \ldots\},$$

are known to be solvable through various techniques. A classical approach in solving such type of equations is by using a discrete function λ^n, where $\lambda \in \mathbb{C} \setminus \{0\}$ and $n \in \mathbb{N}_0$, or by employing the notion of generating functions. In [1], several methods have been presented in solving a special linear recurrence equation related to Fibonacci, Pell, Jacobsthal and Balancing number sequence. On the other hand, however, there is still no known general method