Generalized Order Fibonacci and Lucas Polynomials and Hybrinomials

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Abstract

In this study, we first define generalized order Fibonacci and Lucas polynomials. We show that by special choices one can obtain some known sequences of polynomials and numbers such as order Pell polynomials, order Jacobsthal polynomials, order Fibonacci and Lucas numbers and etc. by using the definition of order Fibonacci and Lucas polynomials. Then we consider hybrid numbers and polynomials whose importance is increasing in mathematics, physics and engineering day by day. We generalize the hybrid polynomials by moving them to the order. Hybrid polynomials that are defined with this generalization are called order Fibonacci and Lucas hybrinomials throughout this paper. We define the generalized order Fibonacci and Lucas hybrinomials using generalized order Fibonacci and Lucas polynomials. Besides this, we give the recurrence relations of the generalized order Fibonacci and Lucas hybrinomials. Also, we show that by special choices in this recurrence relations one can obtain some known hybrid polynomials such as Horadam, Fibonacci, Lucas, Pell, Pell-Lucas, Jacobsthal, Jacobsthal-Lucas hybrinomials. Furthermore, we introduce the generating functions of hybrinomials and give some important properties. Finally, we define the matrix representations of the generalized order Fibonacci and Lucas hybrinomials. For this purpose, we derive the matrices of and that play similar role to the matrix for Fibonacci numbers. We show that by special choices of the integers and , one can obtain matrix representations of some known hybrinomials such as Pell, Jacobsthal hybrinomials and etc.

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