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# ON CIRCULANT MATRICES WITH FIBONACCI QUATERNIONS

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## ABSTRACT

In literature, there exists many papers which compute determinant and some kind of norms of circulant matrices involving some well-known number sequences. At this paper, we obtain an explicit formula for circulant matrix involving the well-known Fibonacci quaternions. Then, we compute determinants of these matrices by exploiting the set of orthogonal polynomial, Chebyshev polynomials of the second kind. Moreover, we obtain Euclidean and Spectral norms of these matrices.

**Keywords** Circulant matrices · Fibonacci quaternions · Chebyshev polynomials · Euclid norms · Spectral norms

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