Abstract

Properties of completely positive and completely bounded operators are fundamental in understanding the applications of operator theory in other fields like quantum mechanics. Up to date the question as to whether completely positive operators are completely bounded has not yet been fully investigated particularly on non-unital C*-algebras. Paulsen established that completely positive operators are completely bounded on unital C*-algebras. However, his study did not focus on non-unital C*-algebras. The question which arises then is: Are completely positive operators completely bounded on non-unital C*-algebras? Therefore, it is interesting to investigate completely positive and completely bounded operators on non-unital C*-algebras. The objectives of this study are to: investigate completely positive operators on non-unital C*-algebras; investigate completely bounded operators on non-unital C*-algebras and establish the relationship between completely positive and completely bounded operators on non-unital C*-algebras. The methodology involved considering C*-algebras from the known ones like $\mathcal{B}(\mathcal{H})$, the C*-algebra of all bounded linear operators on a Hilbert space $\mathcal{H}$ and then investigating the properties of completely positive and completely bounded operators on non-unital C*-algebras. The technical approach in this study included techniques of tensor products and the Haagerup norm which were useful in determining the norms of completely bounded operators. The results obtained from this study are applicable in quantum chemistry in estimation of ground state energy of chemical systems and in genetics to represent the DNA double helix strand using adjoints. Moreover, the results are also useful in commutator approximation and quantum error correction.