An Eigenvalue Problem for Quantum Computing SELMAN HER-SHFIELD, University of Florida — A unitary operator on a quantum spin system of the form, $U = e^{-iH_1}e^{-iH_2}$, is introduced. Here, H_1 and H_2 are Hermitian and easily diagonalized; however, because the diagonalizing bases for H_1 and H_2 are quite different, the operator U is strongly interacting. The eigenvalues of U can be used to help factor products prime numbers in a manner similar, but not identical to the Shor algorithm. Indeed even approximate eigenvalues could be useful. Since U is strongly interacting, the practical usefulness of this approach hinges of finding tractable approximations. Toward this end, results of exact diagonalization of U for small systems are compared with the solution of several different approximate schemes.

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