QuC HW04

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Question 1

A.

The initial realiziation I made was that that the Eigenvectors, $|E_1\rangle$, $|E_2\rangle$, $|E_3\rangle$, and $|E_4\rangle$, were the same values for all values of `ham2factorC`; however the Eigenvalues change with a different pattern: namely $|E_1\rangle$ is the negation of $|E_2\rangle$ and $|E_3\rangle$ is the negation of $|E_4\rangle$, while $|E_2\rangle$ is calculated with $1 +$ `ham2factorC` and $|E_4\rangle$ is calculated with $1 -$ `ham2factorC`! ASK ABOUT THE FINAL PART OF THIS QUESTION

B.

The first thing I notice is that the Eigenvalues follow the same pattern described for the system in question 1A. The second thing I notice is that although the Eigenvalues follow that pattern, the Eigenvectors do not. The $|\psi_{initial}\rangle$ is the same as $|\psi_{final}\rangle$ because the $P_j(t)$ function requires the norm to be taken of both wave functions. The norm of $|\psi_{initial}\rangle = |\psi_{final}\rangle$ for all four values, creating a straight line. The values in the vector are changing, but the norm of the values are always the same.

C.

I found two Hamiltonians that meet the following criteria:

$$H_{total} = (\sigma^x \bigotimes \sigma^x) + C(\sigma^x \bigotimes \sigma^x)$$

and

$$H_{total} = (\sigma^z \bigotimes \sigma^z) + C(\sigma^z \bigotimes \sigma^z)$$

For both of these the bell state is $|\psi_{initial}\rangle = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ 0 \\ 0 \\ -\frac{1}{\sqrt{2}} \end{pmatrix}$ ASK ABOUT THIS!

Question 2

A.

B.

C.

D.