Physics GEMS MAS490

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Homework #4: Due 3/4/1999

i] A coupled harmonic oscillator is described by

$$H = \omega\left[a^{+}a + b^{+}b\right] + \Omega_1\left[a^{+}b + ab^{+}\right]$$

Given: $|\psi_0\rangle = |1,0\rangle$ plot $\langle a^{+}a\rangle(t)$

ii] Collapse of the wavefunction occurs from interaction with the 'environment' . As a model for the 'environment' assume that one of the oscillators, a, in the coupled oscillator is coupled to a resevoir of other oscillators, c. Investigate what happens as the number of oscillators in the resvoir is increased from 1 to many. Let

$$H = \omega\left[a^{+}a + b^{+}b\right] + \Omega_1\left[a^{+}b + ab^{+}\right] + \Omega_2 \sum_{i}^{m}\left[a^{+}c_i + ac_i^{+}\right]$$

Let

$$|\psi_0\rangle = |\overset{abc_1c_2c_3}{1,0,0,0,0,....}\rangle$$

iii] What happens if the resevoir has non zero initial energy?