

## Physics 452: Homework #12

Due Thursday, Feb. 26, 5:00PM, 2008

9.1

9.2 (Worth double) HINT: By differentiating and substituting between the two equations, you should be able to arrive at  $\ddot{c}_a + i\omega_o \dot{c}_a + \frac{|H'_{ab}|^2}{\hbar^2} c_a = 0$ . Try a solution of the form  $c_a = e^{\Gamma t}$ . You will find two possibilities for  $\Gamma$ . The general solution will be a linear combination of the two possibilities:  $c_a(t) = Ae^{\Gamma_1 t} + Be^{\Gamma_2 t}$ . Choose  $A$  and  $B$  to match the prescribed initial conditions  $c_a(0) = 1$  and  $c_b(0) = 0 \Rightarrow \dot{c}_a(0) = 0$ .

Peatross 1. Compute  $H'_{10}(t) = \langle \psi_0 | exE_o \sin \omega_L t \psi_1 \rangle$  and  $H'_{20}(t) = \langle \psi_0 | exE_o \sin \omega_L t \psi_2 \rangle$  for an electron in a harmonic oscillator potential well  $V(x) = m\omega^2 x^2 / 2$  with the external potential  $V'(x,t) = exE_o \sin \omega_L t$ , where  $E_o$  is the electric field of a laser with frequency  $\omega_L$ .  $\psi_n$  refers to the eigen states of harmonic oscillator.