Consider transitions between states when the Hamiltonian has both discrete and continuum spectrum. We derived general form of differential equations for $C_n$ and $C_{\alpha}$ coefficients in the first-order approximation. Substitute the initial conditions in these equations and write down their simplified form in the following cases:

1) At time $t = 0$, the system is in a state $k$ of the discrete spectrum

2) At time $t = 0$, the system is in a state $\alpha'$ of the continuous spectrum