

$$i_0(t) = C_2 \frac{dU_{C_2}(t)}{dt} = \frac{U_e(t)}{R_1} + C_1 \frac{dU_e(t)}{dt}$$

$$GU_e(t) = U_{C_2}(t) + R_2 i_0(t) + U_e(t) \Rightarrow G \frac{dU_e(t)}{dt} = \frac{dU_{C_2}(t)}{dt} + R_2 \left( \frac{1}{R_1} \frac{dU_e(t)}{dt} + C_1 \frac{d^2 U_e(t)}{dt^2} \right) + \frac{dU_e(t)}{dt}$$

$$\Rightarrow G \frac{dU_e(t)}{dt} = \frac{1}{C_2 R_1} U_e(t) + \frac{C_1}{C_2} \frac{dU_e(t)}{dt} + \frac{R_2}{R_1} \frac{dU_e(t)}{dt} + R_2 C_1 \frac{d^2 U_e(t)}{dt^2} + \frac{dU_e(t)}{dt}$$

$$\boxed{\frac{1}{C_2 R_1} U_e(t) + \left( \frac{C_1}{C_2} + \frac{R_2}{R_1} + 1 - G \right) \frac{dU_e(t)}{dt} + R_2 C_1 \frac{d^2 U_e(t)}{dt^2} = 0}$$