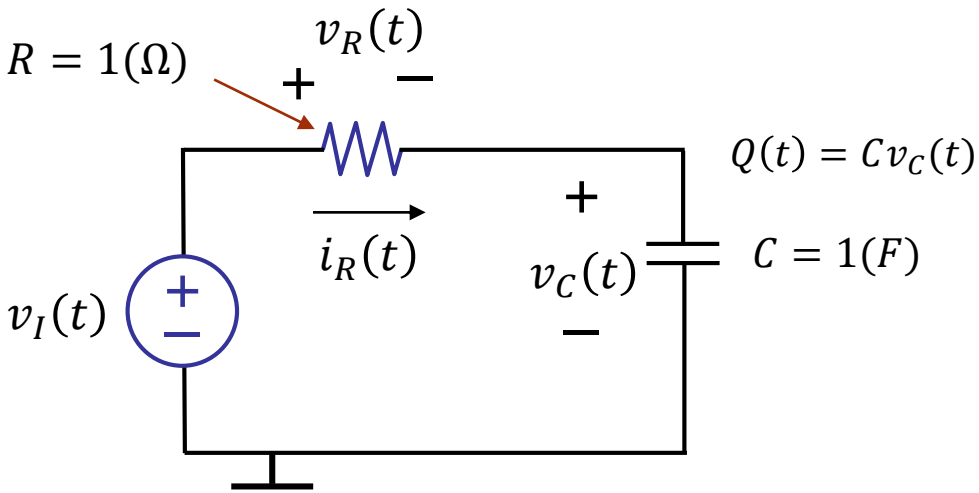
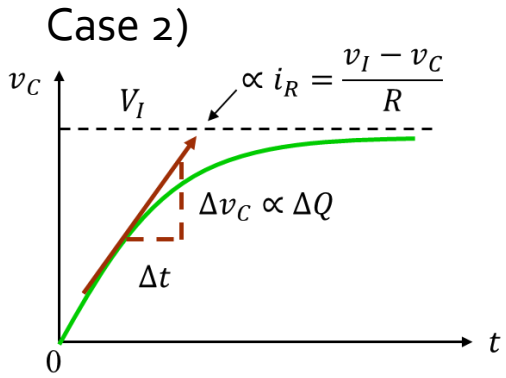
Electrical and Electronics Circuits (4190.206A 002)

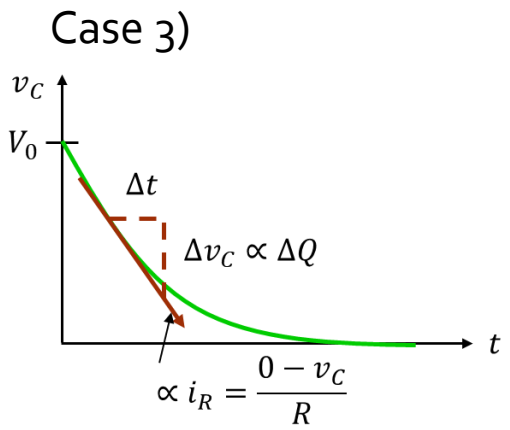
- 1st mid-term exam schedule
  - Oct. 23 (Wed) 2pm~3:15pm
  - Coverage of the exam: chap. 1 ~ chap. 8
  - Exceptions in the coverage
    - There will be no problems related to the underlying physics, or structure of MOSFET, VLSI fabrication in Section 1.5.2, 6.7. Example 2.21~2.
    - Materials related to digital logic design (Section 5.4, 5.5, 5.6) won't be part of the exam, but I can still ask questions about simple digital circuits like problem 2.5 in HW#2.
    - BJT, differential amplifier, op-amp in Example 7.13~7.22.
    - Section 8.2.4 (pg. 423~446)
    - If necessary, eq. (7.75) will be given, so you don't need to memorize eq. (7.75) by itself.
- Make-up class
  - Oct. 22 (Tue) 7pm
  - Location will be announced later
  - During the make-up session, I will review some of the sample problems. These sample problems are not necessarily related to the problems in the exam.
  - We will try to record the lecture, and post it on ETL like the last time, but there might be some delay and recording quality is not guaranteed. Also, there won't be a formal lecture note for this session.
  - If you have any questions, please bring it to the make-up session and ask.
- HW #2
  - **The due date is Today 7:00pm (301-416)**
  - Late submission will be accepted only until Oct. 22 (Tue) 7pm (beginning of the make-up session), because I want to post the solution of HW #2 on the ETL before the exam, and also I want to review some of the HW #2 problems during the make-up session.

Review





- Case 1) $Q(t=0) = 0\ (C), v_I = 0(V)$
  - No change
- Case 2) $Q(t=0) = 0\ (C),\ \ v_I(t \geq 0) = 2(V)$
  - $\Delta Q = C\Delta v_C = \left(\frac{v_I - v_C}{R}\right)\Delta t \xrightarrow{\Delta t \to 0} C\frac{dv_C}{dt} = \frac{v_I - v_C}{R}$
- Case 3) $Q(t=0) = 2\ (C),\ v_I(t \geq 0) = 0(V)$
  - $\Delta Q = C\Delta v_C = \left(\frac{0 - v_C}{R}\right)\Delta t \xrightarrow{\Delta t \to 0} C\frac{dv_C}{dt} = -\frac{v_C}{R}$



Review

- Solution for $C\frac{dv_C}{dt} = -\frac{v_C}{R}$
  - Trial solution: $\frac{1}{2^t}$, $\frac{1}{3^t}$, $\frac{1}{4^t}$, … ➔ need to decide a for $\frac{1}{a^t}$ with $a > 1$
  - By using $a = e^{\ln a}$, $\frac{1}{a^t} = \frac{1}{(e^{\ln a})^t} = \frac{1}{e^{(\ln a)t}} = e^{-(\ln a)t}$
  - Because $-(\ln a)$ is a some constant, use simple constant s
  - By trying $v_C = e^{st}$, $Cse^{st} = -\frac{e^{st}}{R}$ ➔ $s = -\frac{1}{RC}$
  - Does $v_C = e^{-t/RC}$ satisfy all the initial conditions?
    - $v_C = Ae^{-t/RC}$ also satisfy the equation
    - A is a free parameter and should be used to satisfy other conditions.

I will use all the slides in Lecture note 13 again, so there is no new pages.