

فصل 7 کتاب الکساندر، فصل 4 کتاب جبه‌دار

• معرفی خازن $q = f(v, t)$

○ خطی/غیر خطی ، تغییر پذیر با زمان/تغییر ناپذیر با زمان

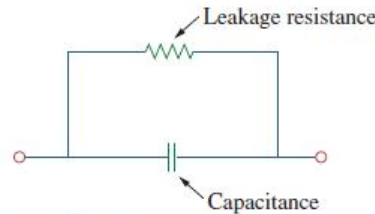


Figure 6.8

Circuit model of a nonideal capacitor.

• معرفی سلف $\phi = g(i, t)$

○ خطی/غیر خطی ، تغییر پذیر با زمان/تغییر ناپذیر با زمان

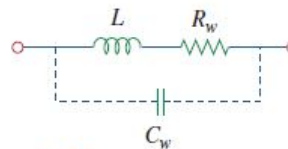


Figure 6.26

Circuit model for a practical inductor.

• توان و انرژی در سلف و خازن

○ حل P. 2-15 از کتاب جبه‌دار

An initially uncharged 1-mF capacitor has the current shown in Fig. 6.11 across it. Calculate the voltage across it at $t = 2$ ms and $t = 5$ ms.

Answer: 100 mV, 400 mV.

Practice Problem 6.4

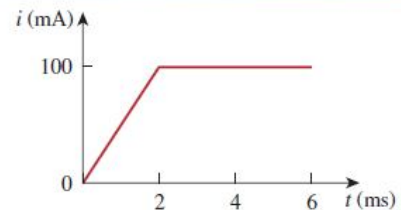


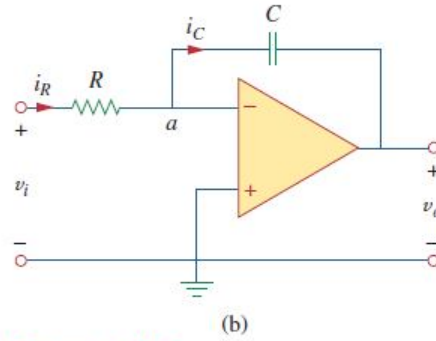
Figure 6.11

For Practice Prob. 6.4.

• ترکیب سری و موازی خازنها و سلفها. (اصل بقای بار و فلو)

کاربرها

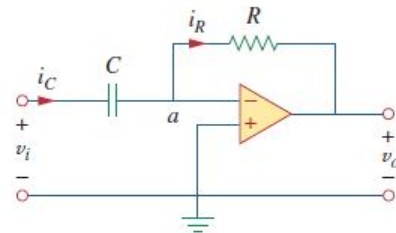
• انتگرال‌تور



$$v_o = -\frac{1}{RC} \int_0^t v_i(\tau) d\tau$$

Figure 6.35
Replacing the feedback resistor in the inverting amplifier in (a) produces an integrator in (b).

• مشتق گیر



$$v_o = -RC \frac{dv_i}{dt}$$

Figure 6.37
An op amp differentiator.

Example 6.14

Sketch the output voltage for the circuit in Fig. 6.38(a), given the input voltage in Fig. 6.38(b). Take $v_o = 0$ at $t = 0$.

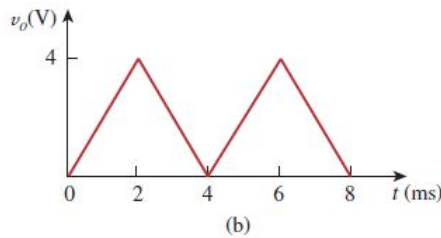
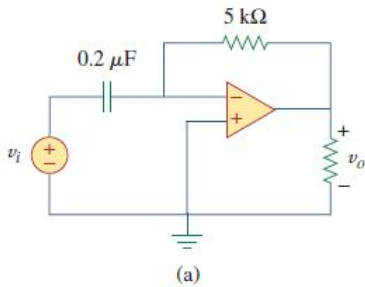


Figure 6.38
For Example 6.14.

- اعداد مختلط
- معرفی معادله دیفرانسیل خطی و روش حل آن
- مثال:

$$\begin{cases} y'' + 3y' + 2y = 9e^{6t} + 3t^2 \\ y(0) = 2 \\ y'(0) = 0 \end{cases}$$

• حل مدار مرتبه یک

- پاسخ ورودی صفر یک مدار RC و RL (پاسخ طبیعی)
- حفظ ولتاژ در خازن و جریان در سلف
- وضعیت مدار در steady State

Practice Problem 7.1

Refer to the circuit in Fig. 7.7. Let $v_C(0) = 45$ V. Determine v_C , v_x , and i_o for $t \geq 0$.

Answer: $45e^{-0.25t}$ V, $15e^{-0.25t}$ V, $-3.75e^{-0.25t}$ A.

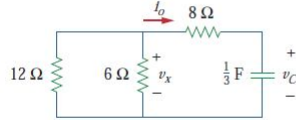


Figure 7.7
For Practice Prob. 7.1.

If the switch in Fig. 7.10 opens at $t = 0$, find $v(t)$ for $t \geq 0$ and $w_C(0)$.

Practice Problem 7.2

Answer: $8e^{-2t}$ V, 5.33 J.

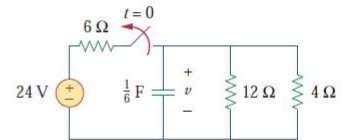


Figure 7.10
For Practice Prob. 7.2.

Find i and v_x in the circuit of Fig. 7.15. Let $i(0) = 5$ A.

Practice Problem 7.3

Answer: $5e^{-4t}$ V, $-20e^{-4t}$ V.

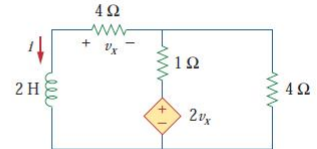


Figure 7.15
For Practice Prob. 7.3.

Practice Problem 7.4

For the circuit in Fig. 7.18, find $i(t)$ for $t > 0$.

Answer: $2e^{-2t}$ A, $t > 0$.

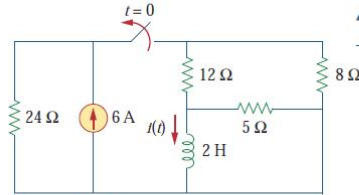


Figure 7.18
For Practice Prob. 7.4.

*7.57 Find $i_1(t)$ and $i_2(t)$ for $t > 0$ in the circuit of Fig. 7.123.

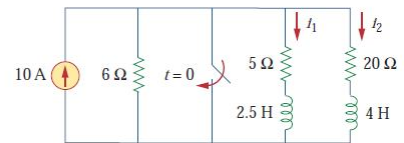


Figure 7.123
For Prob. 7.57.