電路學 (一)　第三次測驗　　四電機二 A　　2015 年 12 月 18 日　(星期五)

1) 滿分 120 分，考試時間 2 小時。
2) 答案應有正確之數值與單位。
3) 可使用計算器，但不得使用電腦、行動電話等通訊器材。不得參閱任何書本及筆記。
4) 請確實遵守考試規則，違反考試規則者，依本校校規處置。

1. Find the value of equivalent capacitance C_{eq} in the circuit of **Fig. 1**. (10%) 10 F.

2. Find the value of C_X in the circuit of **Fig. 2** if the total capacitance C_T is 4 μF. (15%) 4μF.

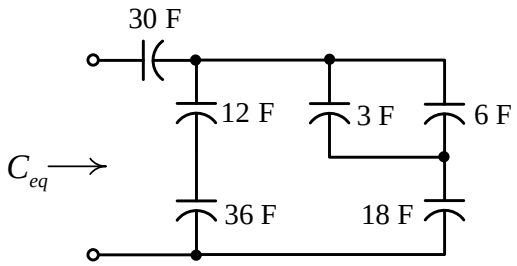

Fig. 1

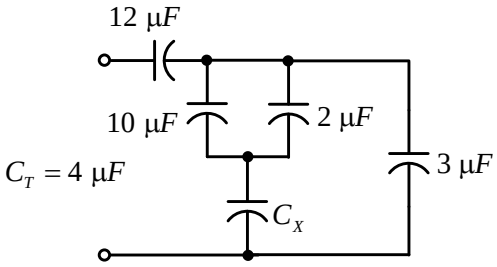

Fig. 2

3. The switch in the circuit of **Fig. 3** is closed at t=0. Find (a) the current i_R, and (b) the voltage v_L, for t>0. (20%)　(a) $5(1-e^{-10t})$ A, (b) $100e^{-10t}$ V.

4. In the circuit shown in **Fig. 4**, the switch has been closed for a long time before opening at t=0. Find the current $i(t)$ for t>0. (10%)　$3e^{-9t}$ A.

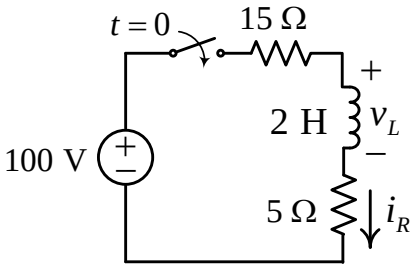

Fig. 3

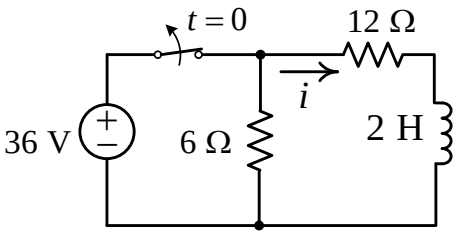

Fig. 4

5. The switch in **Fig. 5** has been closed for a long time before opening at t=0. Find the voltage $v_o(t)$ for t>0. (15%)　$6-\frac{10}{3}e^{-2t}$ V.

6. In the circuit of **Fig. 6**, the initial voltages of the capacitors are $v_{C1}(0^-)$=120 V and $v_{C2}(0^-)$=0. The switch closes at t=0. Find (a) the final values of v_{C1} and v_{C2}, (b) the current $i(t)$ for t>0,(c) the energy dissipated by the resistor R. (15%) (Hint: apply the charge conservation principle.)

(a) v_{C1}=v_{C2}=40 V, (b) $120e^{-t/2}$ A, (c) 14400 J.

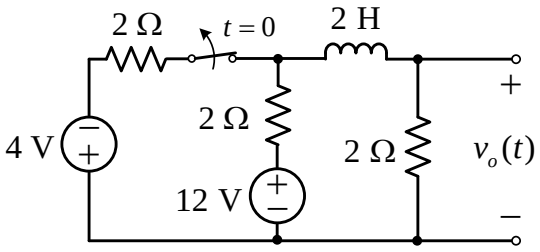

Fig. 5

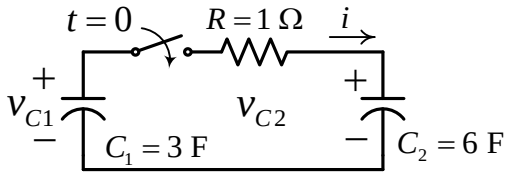

Fig. 6

7. The circuit in **Fig. 7** has reached steady-state before the switch closes at t=0, find $v_o(t)$ for t>0. (20%) $24+36e^{-t/12}$ V.

8. In the circuit shown in **Fig. 8**, inductor L_1=6 H has an initial current of 9 A. The current in inductor L_2=12 H is zero for t<0. The switch is opened at t=0. Find (a) the final values of i_{L1} and i_{L2}, (b) $i_R(t)$ for t>0, (c) the energy dissipated by the 4-Ω resistor. (15%) (Hint, apply the principle of magnetic flux linkage conservation.) (a) $i_{L1}=i_{L2}$=3A, (b) $9e^{-t}$ A, (c) 162 J.

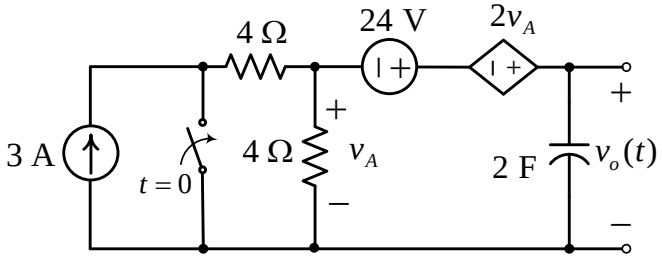

Fig. 7

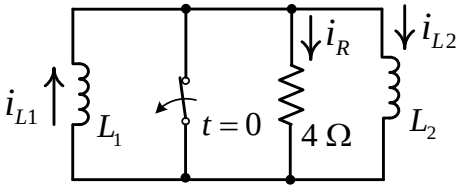

Fig. 8