上海科技大学

2017-2018 学年第 1 学期本科生第 2 次期中考试卷

姓名：_____

学院：_____

学号：_____

开课单位：信息学院

授课教师：周平强

考试科目：《电路基础》

课程代码：EE111

考试时间：2016 年 11 月 28 日 10 点 15 分 – 12 点 15 分。

考试成绩录入表：

题目	1	2	3	4	5	总分
计分						
复核						

评卷人签名： **复核人签名：**

日期： **日期：**

编写说明：

1. 要求评卷人和复核人不能是同一人。
2. 试卷内页和答题纸编排格式由各学院和出题教师根据实际需要自定，每页须按顺序标注页码（除封面外），要求排版清晰、美观，便于在页面左侧装订。为方便印刷归档，建议使用 A4 双面印刷（学校有印刷一体机提供）。
3. 主考教师编写试卷时尽可能保证试题科学、准确、合理，如考试过程中发现试题有误，主考教师需负责现场解释，此类情况学校将作为教学评估记录的一部分。

Problem 1 (15 pts) — First-Order RL Circuit Analysis

The current and voltage at the terminals of the inductor in Fig. 1 are

$$\mathrm{i(t)} = (4 + 4e^{-40t})\mathrm{A}, \mathrm{t} \geq 0;\ \mathrm{v(t)} = -80e^{-40t}\mathrm{V}, \mathrm{t} \geq 0.$$

a) Find the numerical values of V_s, R, L, and I_0 (the initial current of L at $\mathrm{t} = 0$);

b) How many milliseconds after the switch has been closed does the energy stored in the inductor reach 9 Joule?

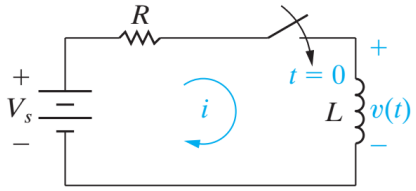

Fig. 1 for Problem 1.

Problem 2 (20 pts) — First-order RL Circuit Analysis

Before it closes at time t = 0, the switch in the circuit shown in Fig. 2 has been open for a long time. Find the current through the inductor $i_o(t)$ for $t \geq 0$.

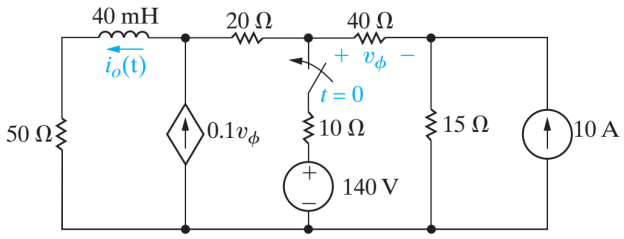

Fig. 2 for Problem 2.

Problem 3 (20 pts) — Second-order RLC circuit

The initial value of the voltage v in the circuit shown in Fig. 4 is zero, and the initial value of the capacitor current, $i_c(0^+)$, is 45mA. The expression for the capacitor current is known to be $i_c(t) = A_1e^{-200t} + A_2e^{-800t}, t \geq 0^+$. $R = 250\Omega$. Find

a) The values of L, C, A_1 and A_2.

b) The express for $v(t), t \geq 0$.

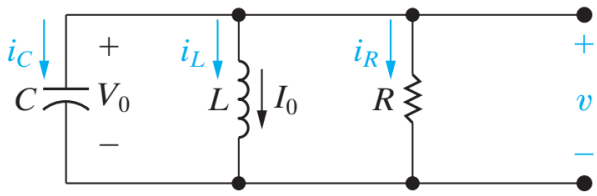

Fig. 5 for Problem 5.

Problem 4 (15 pts) — Second-order RLC circuit

Determine the Thevenin equivalent circuit of the circuit shown in Fig. 5 at terminals (a, b), given that $v_s(\mathrm{t}) = 12\cos 2500t\,\mathrm{V}$, $i_s(\mathrm{t}) = 0.5\cos(2500t - 30°)\mathrm{A}$.

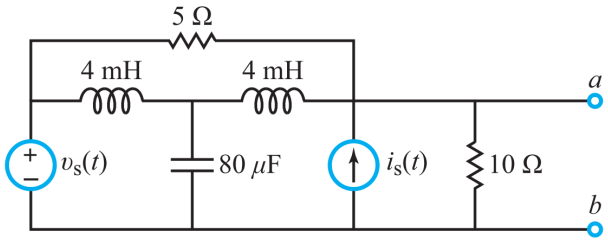

Fig. 5 for Problem 5.

Problem 5 (30 pts) — Second-order RLC circuit

In the circuit shown in Fig. 6, the switch was closed at $t = 0$ and re-opened at $t = 0.5$s. Determine the response $i_L(\mathrm{t})$ for $t \geq 0$. Before $t = 0$, there is no energy stored in the inductor and capacitor.

Assume that $V_s = 18\mathrm{V}$, $R_s = 1\Omega$, $R_1 = 5\Omega$, $R_2 = 2\Omega$, $L = 2\mathrm{H}$, and $C_1 = \frac{1}{17}\mathrm{F}$.

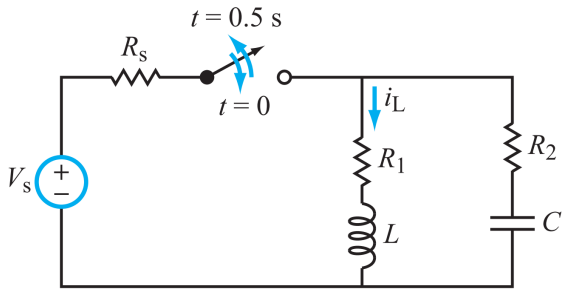

Fig. 6 for Problem 6.