课程编号：101051247　　北京理工大学 2021 — 2022 学年 第 二 学期

2021 级 电路分析基础（全英文） 课程试卷 B

开课学院：集成电路与电子学院　　任课教师：邓小英

试卷用途：☐期中　☑期末　☐补考　☐重修

考试形式：☐开卷　☐半开卷　☑闭卷

考试日期：2022 年 5 月 29 日　　所需时间：120 分钟

考试允许带：计算器和必要的文具　　入场

班级：＿＿＿＿＿＿　学号：＿＿＿＿＿＿　姓名：＿＿＿＿＿＿

在线考试诚信承诺书

考试是对知识与能力的检验，也是对道德素质的检验。在线考试也必须恪守诚信原则。

我已成功下载本次《电路分析基础(全英文)》课程期末考试试卷，并承诺在考试过程中严于律己，自觉遵守以上考试规则，诚信考试。

承诺人（签字）：

年　　月　　日

题序	1	2	3	4	5	6	7	8	9	总分
满分	8	8	7	8	7	8	8	8	8	70
得分										

注意：

1. 试题共 9 题，共 4 页（包含此页）；

2. 所有试题都要写清过程（用英文），结果保留 1 位小数即可。

1. (8 points) For the circuit shown in Fig.1, (1) find V_o ; (2) calculate the power developed by the dependent source, and determine whether the power is supplied or absorbed.

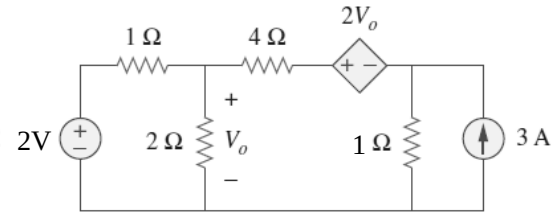


Fig.1

2. (8 points) In the steady-state circuit shown in Fig.2, R=4Ω, L=1H, $v_S(t) = \cos \omega t$ V.
(1) Determine the value of C that will cause the resonance at ω_0=100rad/s for the circuit ;
(2) Calculate the quality factor Q at resonance and the half-power frequencies ω_1, ω_2 ;
(3) Find the transfer function $\mathbf{H}(\omega) = \dot{\mathbf{V}}_O / \dot{\mathbf{V}}_S$, draw the sketch plot of $|\mathbf{H}(\omega)|$ and determine the type of filter (lowpass/highpass/bandpass/bandstop).

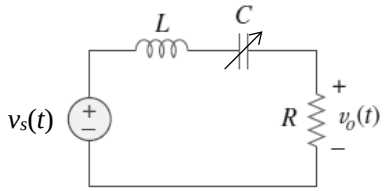


Fig. 2

3. (7 points) The switch in Fig.3 has been open for a long time, and is closed at t =0.
(1) Determine $v(0^+)$ and $i(0^+)$, $\dfrac{\mathrm{d}v(0^+)}{\mathrm{d}t}$ and $\dfrac{\mathrm{d}i(0^+)}{\mathrm{d}t}$;
(2) For t > 0, write the second-order circuit equation about $v(t)$ and determine what type of damping this circuit exhibits (over-damped/under-damped/critically-damped).

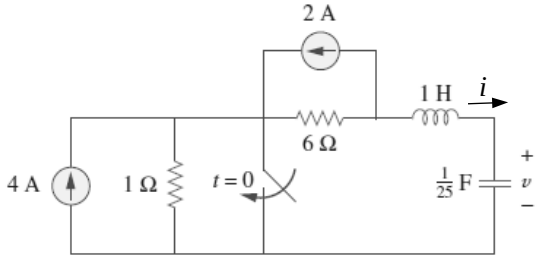


Fig.3

4. (8 points) Find the value of R that enables the circuit shown in Fig.4 to deliver the maximum power to terminals a-b. Then calculate the power delivered to R.

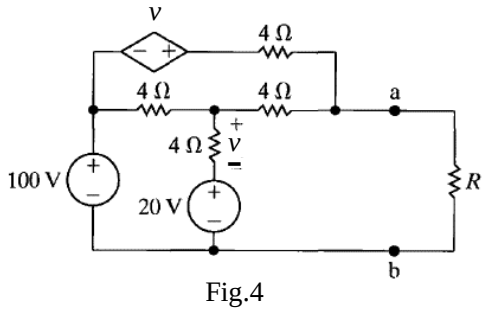


Fig.4

5. (7 points) Caculate the current I_0 when R=28kΩ and R=100kΩ， respectively.

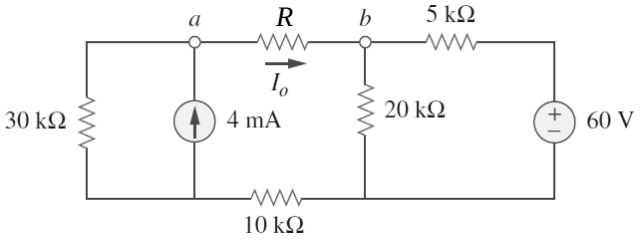


Fig.5

6. (8 points) For the steady-state circuit shown in Fig.6, find $i_o(t)$.

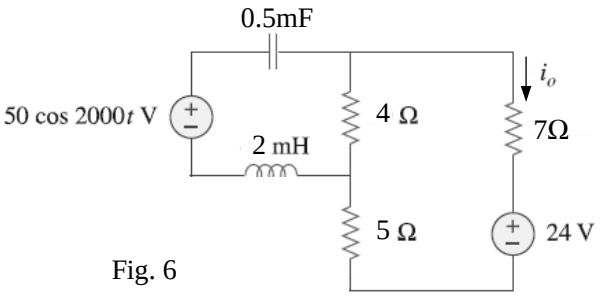


Fig. 6

7. (8 points) The sinusoidal circuit is shown in Fig. 7.

(1) Find the total average power P developed by load 1 and load 2.

(2) Find the total reactive power Q developed by load 1 and load 2.

(3) Calculate the power factor of the parallel combination.

(4) What element should be connected with the load 1 and load 2 that will raise the power factor to 1? Calculate the value of the capacitance (if the element is a capacitor) or the inductance (if the element is an inductor).

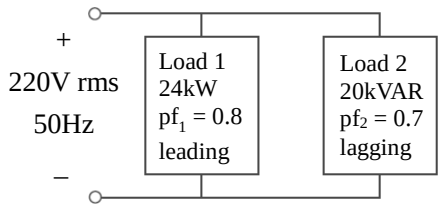
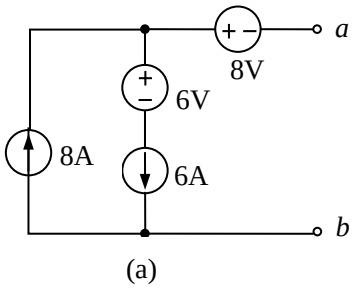
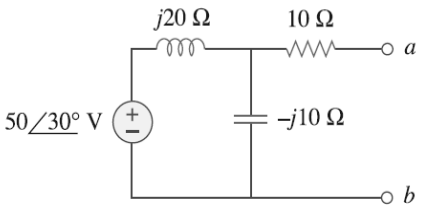


Fig. 7

8. (8 points) Simplify the following circuits in Fig.8.



(a)



(b)

Fig.8

9. (8 points) In the circuit shown in Fig.9, $U_S = 10\text{V}$, $R_1 = 6\Omega$, $R_2 = R_3 = 4\Omega$, $L = 1\text{H}$, $C = 2\text{F}$, the switch has been open for a long time, and is closed at t =0. Find the current $i(t)$ for $t > 0$.

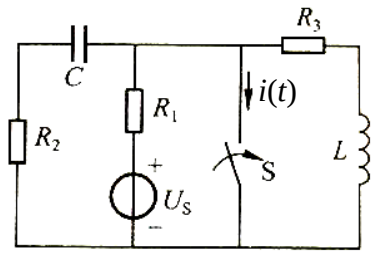


Fig.9