

华东交通大学 2018 —2019 学年第 二 学期考试卷

(B) 卷

课程名称: 电路原理 I 考试时间: 120 分钟 考试方式: 闭卷

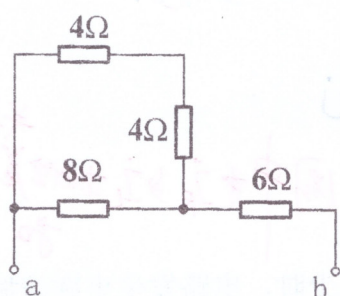
学生姓名: _____ 学号: _____ 教学班级: _____ 教学小班序号: _____

题号	一	二	三	四	五	六	七	八	九	十	总分
得分											
阅卷人											

一、 计算题(每题 4 分, 共 12 分)

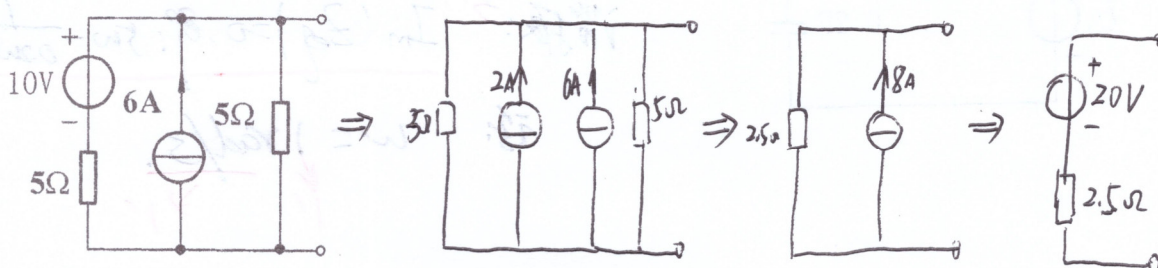
得分

1、电路如图, 求 R_{ab} 。

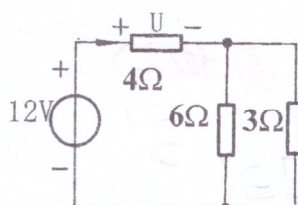


$$\begin{aligned} R_{ab} &= (4+4) \parallel 6 + 4 \\ &= 4 + 6 \\ &= 10 \Omega \end{aligned}$$

2、将如图电路化简为一个电压源与一个电阻的串联组合。



3、电路如图, 求电压 U 以及电压源的功率 (说明吸收还是发出)。



$$I = \frac{12}{6 \parallel 3 + 4} = 2 \text{ A}$$

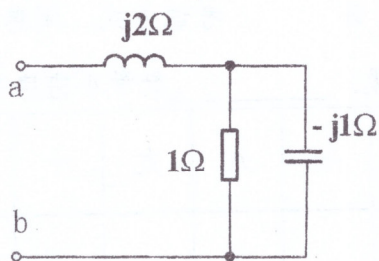
$$U = 2 \times 4 = 8 \text{ V}$$

$$P = 12 \times 2 = 24 \text{ W (发出)}$$

二、计算题(每题 7 分, 共 28 分)

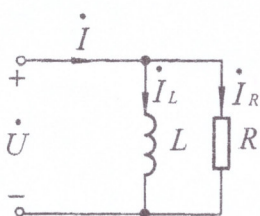
得分

1、求输入阻抗 Z_{ab} 。



解: $Z_{ab} = j2 + [1 // (-j1)]$
 $= (\frac{1}{2} + j\frac{3}{2}) \Omega \rightarrow 1'$
 或: $= (0.5 + j1.5) \Omega$
 $= 1.58 \angle 71.57^\circ \Omega$

2、电路如图, 已知 $I_R = 3A$, $I_L = 4A$, 求有效值 I 。



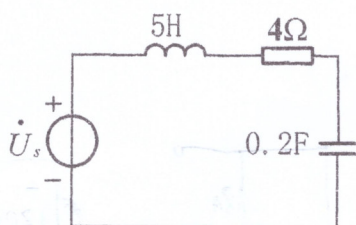
解: $I = \sqrt{I_R^2 + I_L^2} = 5A \rightarrow 1'$

若有图:
(3')



图中 I_R 与 I_L 相位差不对
关系
和 1 分。

3、电路如图所示, 已知 $u_s = 100\sqrt{2} \cos \omega t V$, 求 ω 是多少时, 电路发生串联谐振?

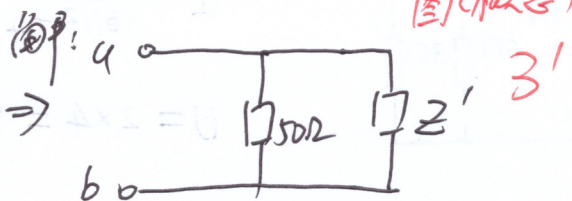
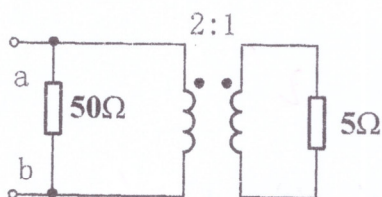


解: $Z_{eq} = 4 + j(5\omega - \frac{1}{0.2\omega})$

谐振: $Im(Z_{eq}) = 0, \text{即: } 5\omega - \frac{1}{0.2\omega} = 0$

得: $\omega = 1 \text{ rad/s}$

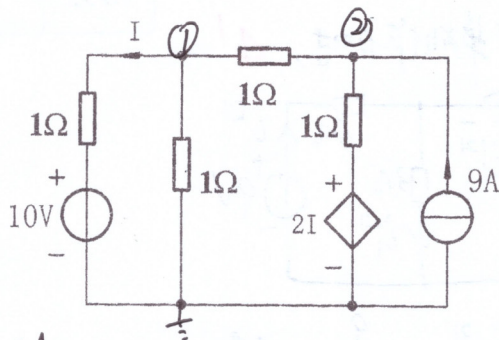
4、电路如图所示, 求 ab 端的等效电阻。



$Z' = 2^2 \times 5 = 20 \Omega$

$R_{ab} = 50 // Z' = \frac{100}{3} \Omega$
 或 $\approx 33.33 \Omega$

三、电路如图所示，用结点电压法求电流 I 。(10 分)

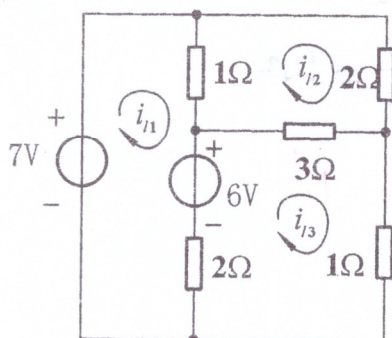


得分

解 参考点及结点如图所示。

$$\left. \begin{array}{l} \text{结点① } (\frac{1}{1} + \frac{1}{1} + \frac{1}{1})U_{n1} - U_{n2} = \frac{10}{1} \quad 2' \\ \text{— ② } -U_{n1} + (\frac{1}{1} + \frac{1}{1})U_{n2} = 9 + \frac{2I}{1} \quad 2' \\ \text{补充: } U_{n1} = 1 \times I + 10 \quad 3' \end{array} \right\} \Rightarrow \begin{array}{l} U_{n1} = 3V \quad 1' \\ U_{n2} = -1V \quad 1' \\ I = -7A \quad 1' \end{array}$$

四、电路如图所示，求各回路电流。(8 分)

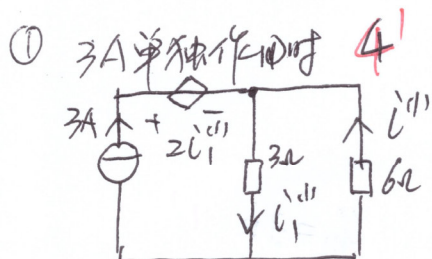
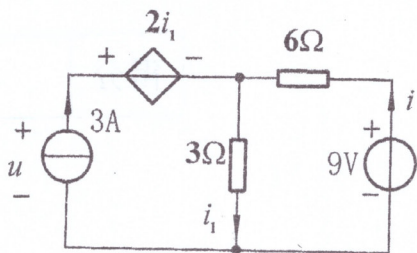


得分

$$\left. \begin{array}{l} \text{解 回路1: } (1+2)\dot{i}_{e1} - \dot{i}_{e2} - 2\dot{i}_{e3} = 7-6 \quad 2' \\ \text{— 2: } -\dot{i}_{e1} + (1+2+3)\dot{i}_{e2} - 3\dot{i}_{e3} = 0 \quad 2' \\ \text{— 3: } -2\dot{i}_{e1} - 3\dot{i}_{e2} + (1+2+3)\dot{i}_{e3} = 6 \quad 2' \end{array} \right\} \Rightarrow \begin{array}{l} \dot{i}_{e1} = 3A \\ \dot{i}_{e2} = 2A \quad 2' \\ \dot{i}_{e3} = 3A \end{array}$$

五、电路如图所示，用叠加定理求 u 和 i 。(10 分)

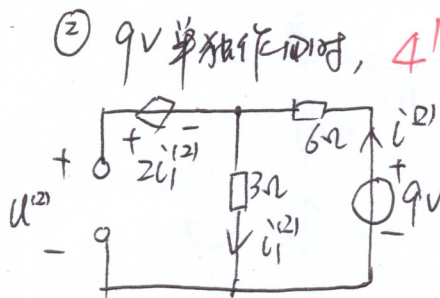
得分



$$i_1^{(1)} = \frac{6}{6+3} \times 3 = 2A$$

$$i^{(1)} = -\frac{3}{6+3} \times 3 = -1A$$

$$u^{(1)} = 2i_1^{(1)} + 3i^{(1)} = 5i_1^{(1)} = 10V$$



$$i_1^{(2)} = i^{(2)} = \frac{9}{6+3} = 1A$$

$$u^{(2)} = 2i_1^{(2)} + 3i^{(2)} = 5i_1^{(2)} = 5V$$

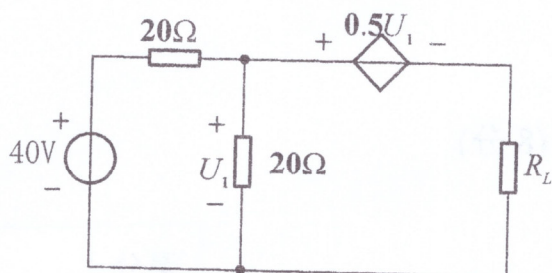
③ $u = u^{(1)} + u^{(2)} = 15V$ 2'

$$i = i^{(1)} + i^{(2)} = 1 + (-1) = 0A$$

六、电路如图所示，问电阻 R_L 为何值时能获得最大功率，并求此最大功率。

(10 分)

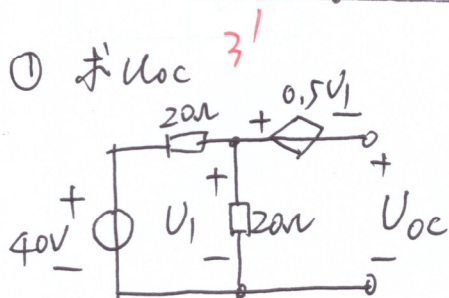
得分



$$U_1 = 20 \times \frac{1}{2} I_0 = 10 I_0$$

$$U_0 = -0.5 U_1 + U_1 = 0.5 U_1 = 0.5 \times 10 I_0 = 5 I_0$$

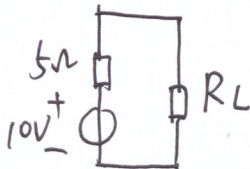
$$\therefore R_{eq} = \frac{U_0}{I_0} = 5\Omega$$



$$U_1 = \frac{20}{20+20} \times 40 = 20V$$

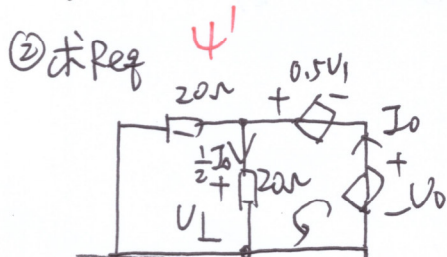
$$U_{oc} = -0.5 U_1 + U_1 = 0.5 U_1 = 10V$$

③ 戴维等效电路 1'



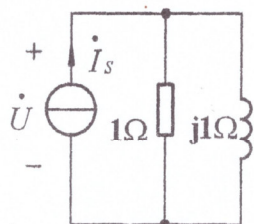
④ 当 $R_L = R_{eq} = 5\Omega$ 时, R_L 获最大功率. 2'

$$P_{max} = \frac{U_{oc}^2}{4R_{eq}} = \frac{10 \times 10}{4 \times 5} = 5W$$



七、电路如图所示，已知 $\dot{I}_s = 2\angle 30^\circ \text{ A}$ ，求电压 $\dot{U}$ ，以及电源的有功功率 P 、无功功率 Q 、视在功率 S 和功率因数 λ 。(10 分)

得分



解: $Z = \frac{1 \times j1}{1 + j1} = \frac{\sqrt{2}}{2} \angle 45^\circ \Omega$

$\dot{U} = Z I_s = \sqrt{2} \angle 75^\circ \text{ V}$

$P = U I_s \cos \varphi = \sqrt{2} \times 2 \times \cos(75^\circ - 30^\circ)$

$= 2 \text{ W}$

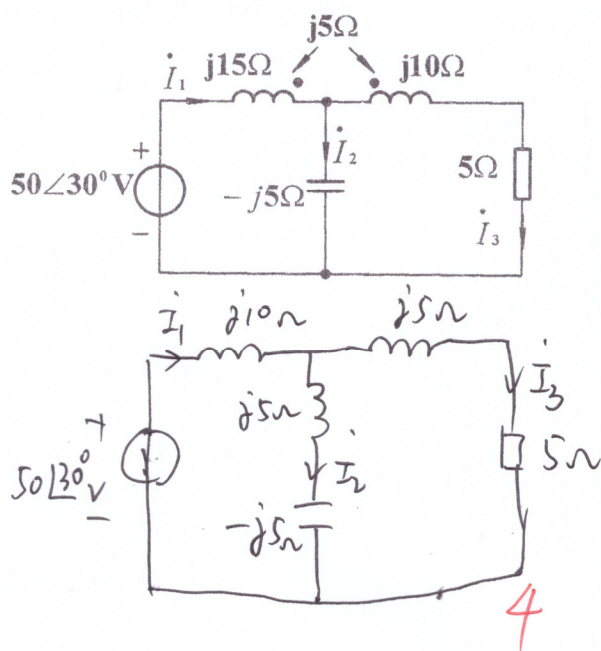
$Q = U I_s \sin \varphi = 2 \text{ Var}$

$S = U I_s = 2\sqrt{2} \text{ VA}$

$\cos \varphi = \cos(75^\circ - 30^\circ) = \frac{\sqrt{2}}{2}$

八、电路如图所示，求 $\dot{I}_1, \dot{I}_2, \dot{I}_3$ 。(12 分)

得分



$Z = j10 \Omega$

$\dot{I}_1 = \dot{I}_2 = \frac{50 \angle 30^\circ}{j10}$

$= 5 \angle -60^\circ \text{ A}$

$\dot{I}_3 = 0$