110 EE01

# 臺北科技大學 110 學年度碩士班招生考試

## 系所組別：2110、2120 電機工程系碩士班甲、乙組

## 第一節　電路學　試題



**注意事項：**

1. 本試題共 10 題，每題 10 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. In Fig. 1, based on the superposition, please find the component of $v_o$ resulting from the 40V source, and the component of $v_o$ resulting from the 5A source. (5%, 5%)

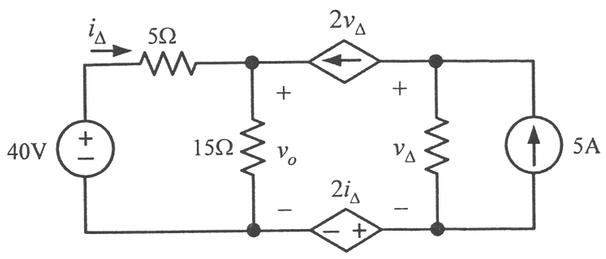


Fig. 1

2. In Fig. 2, find the efficiency under the maximum power transferred from $V_i$ to $R_o$, where the efficiency is defined to be output power ($P_o$) divided by output power ($P_i$) multiplied by 100%. (10%)

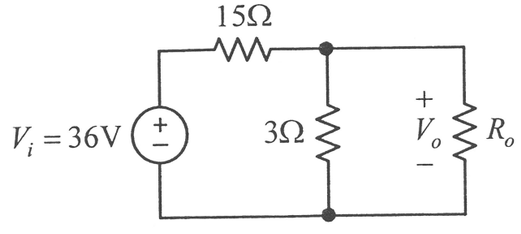


Fig. 2

3. a) Find the value of $R_o$ that enables the circuit shown in Fig. 3 to deliver the maximum power to the terminals $a$, $b$. (5%)
   b) Find the maximum power delivered to $R_o$. (5%)

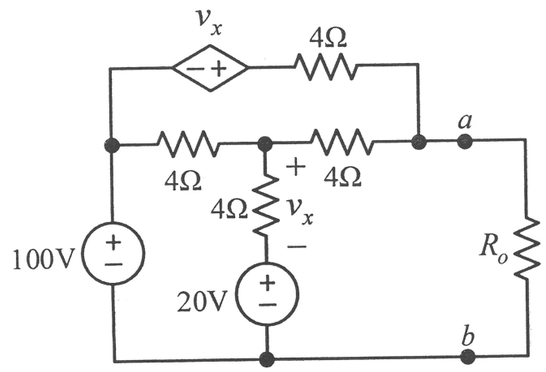


Fig. 3

4. Use the node-voltage method to find the voltage $v_o$ in the circuit shown in Fig. 4. (10%)

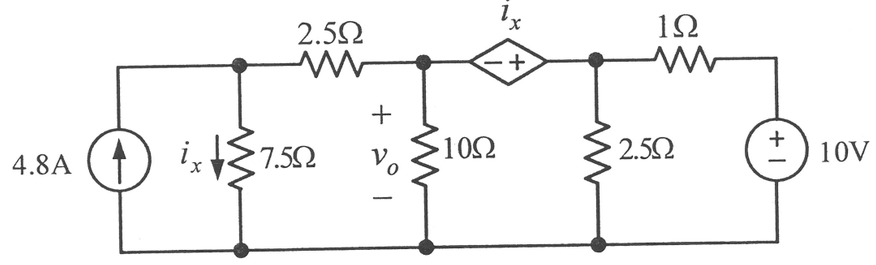


Fig. 4

5. Use the mesh-current method to find the current $i_a$ in the circuit shown in Fig. 5. (10%)

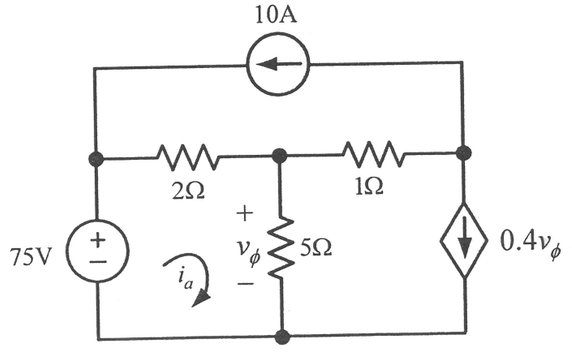


Fig. 5

注意：背面尚有試題

6. There is no energy stored in the following circuit. At $t=0$, the switch is closed. Find $i_1(t)$, $i_2(t)$ and $\lambda_1(t)$ at $t=\infty$, where $\lambda_1(t)$ is the primary flux linkage equal to $L_1 i_1(t)$. (3%, 3%, 4%)

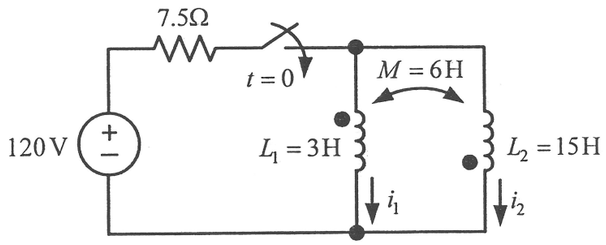


Fig. 6

7. There is no energy stored in the 0.1H inductor in Fig. 7, but there is energy stored in the 0.4μF capacitor with the initial value 96V. Please find $v_c(t)$ for $t \geq 0$. (10%)

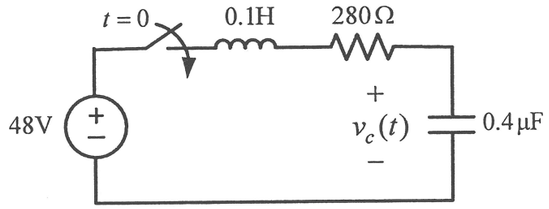


Fig. 7

8. In the steady state with $v_i(t)$ shown in Fig. 8, find the component of $v_o(t)$ due to the third harmonic of $v_i(t)$ after $h(t)$, where $H(s)=\dfrac{V_o(s)}{V_i(s)}=\dfrac{3\pi}{s+3\pi}$ and $h(t)$ is the inverse Laplace of $H(s)$. (10%)

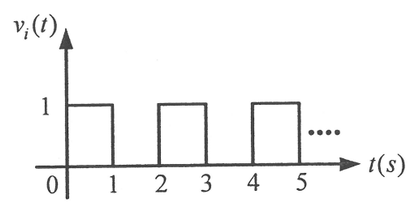


Fig. 8

9. Find the steady-state component of $v_o(t)$ due to the input voltage $v_i(t)$ of $u(t)$ V, with $H(s)=\dfrac{V_o(s)}{V_i(s)}=\dfrac{96(s+5)(s+12)}{(s+6)(s+8)}$, where $u(t)$ is the unit step function. (10%)

10. Find *y* parameters of the two-port circuit shown in Fig. 9. (10%)

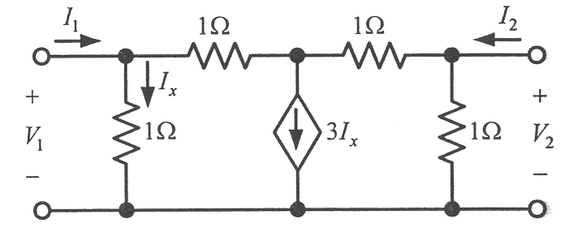


Fig. 9