

國立高雄第一科技大學 100 學年度碩士班招生考試 試題紙

系所別：電子工程系

組別：不分組

考科代碼：2234

考科：電路學

注意事項：

- 1、本科目得使用本校提供之電子計算器。
- 2、請於答案卷上規定之範圍作答，違者該題不予計分。

1. The current in and the voltage across a 5H inductor are known to be zero for  $t < 0$ . The voltage across the inductor is given by the graph in Fig. 1 for  $t \geq 0$ . Sketch  $i$  versus  $t$  for  $0 \leq t < \infty$ . (10%)

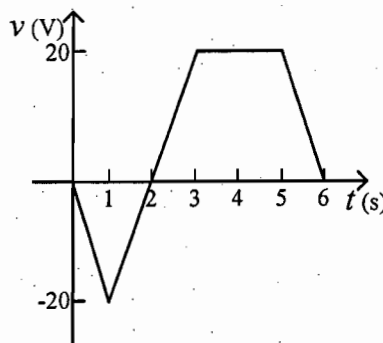


Fig. 1

2. The resistors  $R_1$  and  $R_2$  are in parallel, as shown in Fig. 2(a). The resistance of  $R_1$  is  $3 \Omega$  and the  $v$ - $i$  relationship of  $R_2$  is described in Fig. 2(b). Determine the input resistance  $R_{ab}$ . (10%)

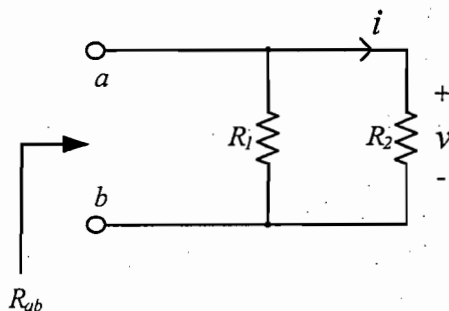


Fig. 2(a)

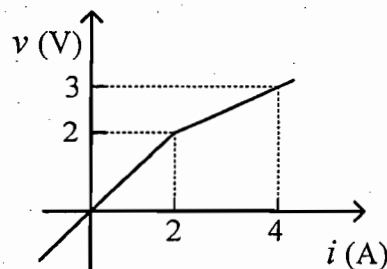


Fig. 2(b)

3. Find the Thevenin equivalent with respect to the terminals  $a$  and  $b$  for the circuit in Fig. 3. (10%)

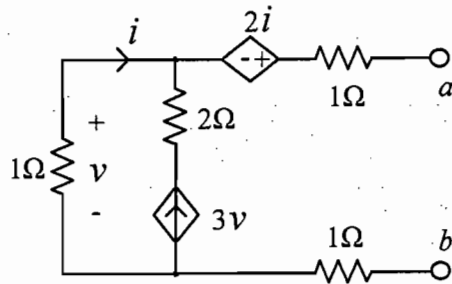


Fig. 3

4. In Fig. 4, the voltage source  $v_s$  is equal to  $10\sqrt{2}\sin 3t$  V and the transformer is ideal with turns ratio 10:1. Find the Norton equivalent with respect to the terminals  $a$  and  $b$ . (10%)

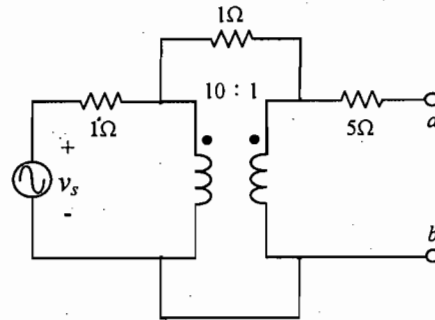


Fig. 4

5. There is no energy stored in the inductor at the time the switch is closed in the circuit seen in Fig. 5. Suppose that the voltage is  $10\sqrt{2}\sin 3t$ , find the current  $i(t)$  for  $t \geq 0$ . (10%)

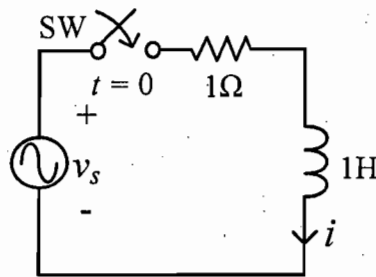


Fig. 5

6. The switch in the circuit shown in Fig. 6 has been closed for a long time before it is opened at  $t = 0$ . Assume that the circuit parameters are such that the response is underdamped. Derive the relationship among  $R$ ,  $C$  and  $L$ . If  $v_{in}$  is  $48V_{dc}$ , find  $\frac{di_o}{dt}(t = 0^+)$ . (10%)

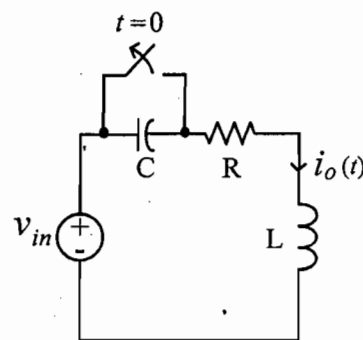


Fig. 6

7. No energy is stored in the circuit shown in Fig. 7 when the input voltage  $v_{in}$  jumps instantaneously from 0 to 25mV. How long is it before the circuit saturates? (10%)

8. A linear transformer couples a load  $\bar{Z}_L$  to a sinusoidal voltage source, as shown in Fig. 8. If the voltage source has internal impedance  $\bar{Z}_S$ , determine the input impedance  $\bar{Z}_{ab}$ . (10%)

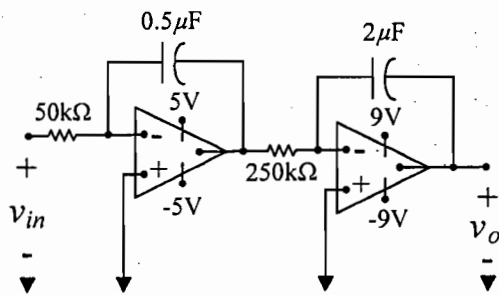


Fig. 7

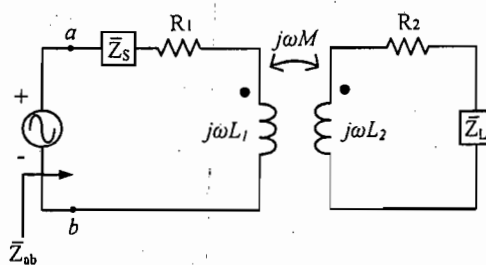


Fig. 8

9. An uncharged  $20\mu\text{F}$  capacitor is driven by a sinusoidal current with amplitude of  $5\text{A}$  and frequency  $60\text{Hz}$  for  $t \geq 0$ . a) Derive expressions for the capacitor voltage, instantaneous power, average power, and energy. b) Sketch the voltage, current, instantaneous power, average power, and energy as functions of time. Line up the plots vertically. (10%)
10. Three loads are connected in parallel across a  $2.4\text{ kV}_{\text{rms}}$  line. Load 1 absorbs  $10\text{ kW}$  and  $40\text{ kVAR}$ . Load 2 absorbs  $50\text{ kVA}$  at  $0.6$  pf lead. Load 3 absorbs  $20\text{ kW}$  at unity power factor. Find the current drawn from the line and the power factor of the equivalent load as seen from the line's input terminals. (10%)