大同大學 106 學年度（暑）轉學入學考試試題

考試科目：電路學　　系別：電機工程學系　　第½頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

一、簡答題：（每題10分，合計30分）

1. 簡述下列定律：①克希荷夫電流定律（KCL）②希荷夫電電壓定律（KCL）③歐姆定律

2. 何謂開路（open circuit）？何謂短路（short circuit）？何謂相依電源（dependent source）？

3. 請分別寫出電容器與電感器之電壓-電流關係式及所儲存之能量各為何？

二、計算題：（每題10分，合計70分）

1. Determine the minimum resistor size in the circuit of Fig. 1 that can be connected to a given battery without exceeding the resistor's 1/4 W power rating. ***Known Quantities:*** Battery voltages: 1.5 and 3 V.

2. Determine the voltage v_3 in the circuit of Fig. 2. ***Known Quantities:*** R_1= 10 Ω; R_2= 6 Ω; R_3= 8 Ω; V_s= 3 V.

3. Determine the current i_1 in the circuit of Fig. 3. ***Known Quantities:*** R_1= 10 Ω; R_2= 2 Ω; R_3= 20 Ω; I_s= 4 A.

4. The Wheatstone bridge circuit is shown in Fig. 4. Please find the unknown resistance R_x.

   Known Quantities: R_1=R_2=R_3=1 kΩ, v_s=12 V, and V_{ab}= 12 mV

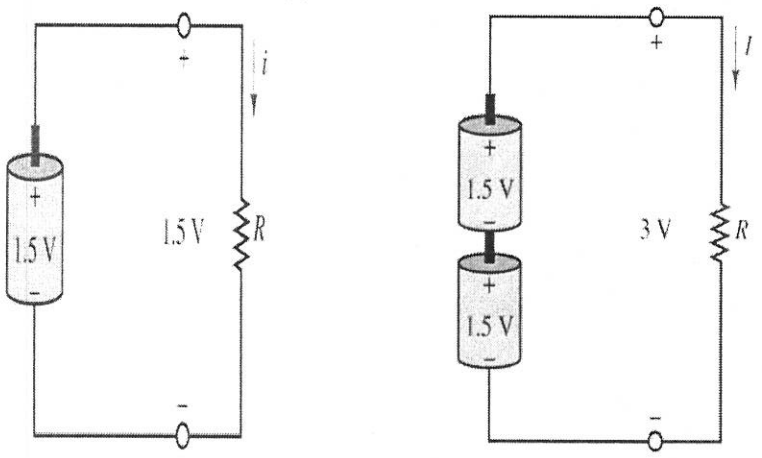

Fig. 1

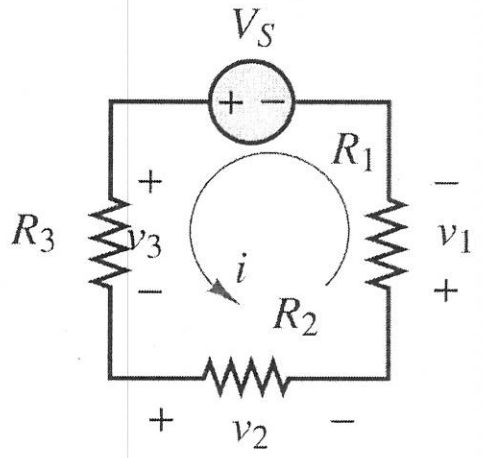

Fig. 2

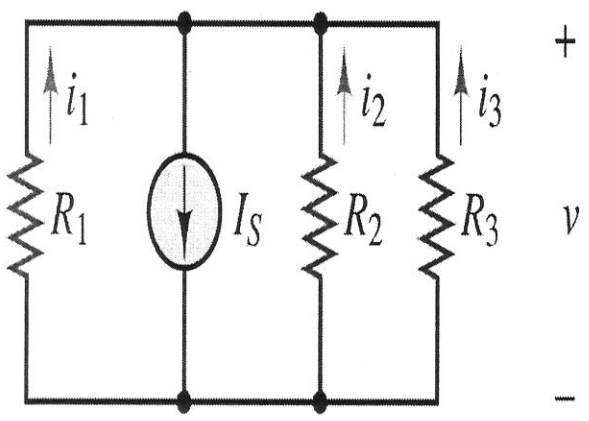

Fig. 3

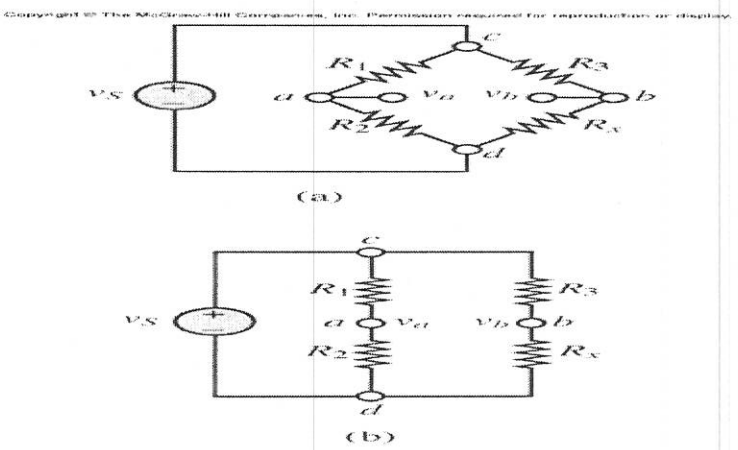

Fig. 4

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5. Use node analysis to determine the current *i* flowing through the voltage source in the circuit of Fig. 5. Assume that R_1= 2 Ω; R_2= 2 Ω; R_3= 4 Ω; R_4= 3 Ω; I= 2 A; V= 3 V.

6. Find the unknown voltage v_x in the circuit of Fig. 6.

Given data: Vs= 10 V; Is= 2 A; R_1= 5 Ω; R_2= 2 Ω; R_3= 4 Ω.

7. Compute the Thevenin equivalent (open circuit voltage V_T and equivalent impedance Z_T) of the circuit of Fig. 7.

Known Quantities: Z_1= 5 Ω ; Z_2= j20 Ω ; $v_s(t)$=110cos(377t) V.

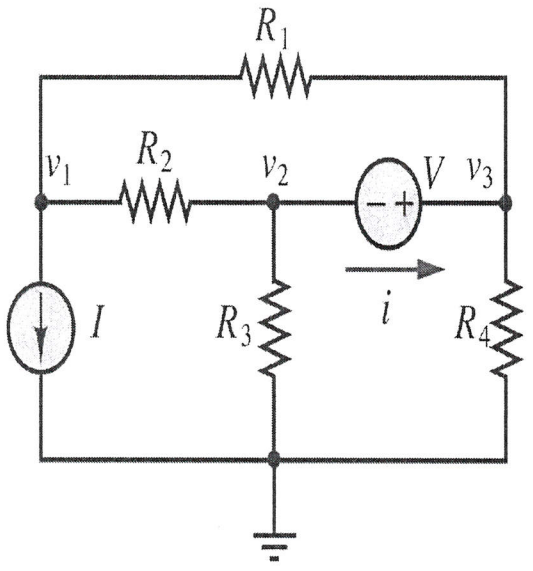


Fig. 5

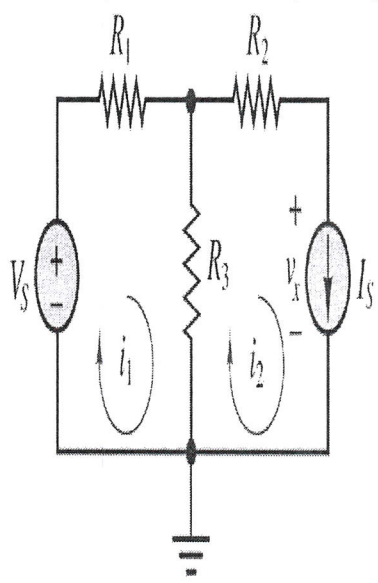
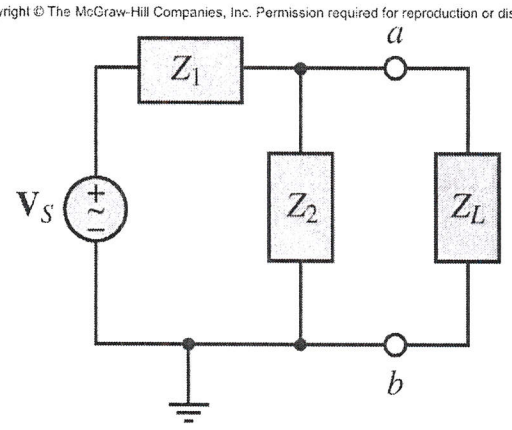


Fig. 6



$\mathbf{V}_S = 110\angle 0°$ $Z_1 = 5\ \Omega$ $Z_2 = j20\ \Omega$

Fig. 7