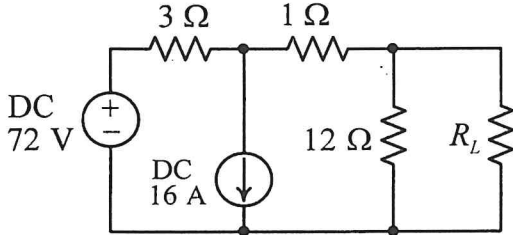




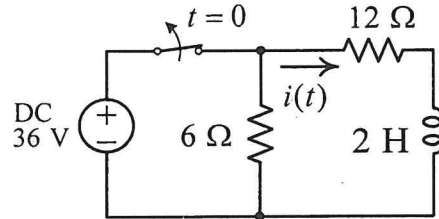
國立雲林科技大學 109 學年度  
碩士班招生考試試題

系所：電機系  
科目：電路學

- 圖一之電路中，若電阻  $R_L$  欲獲得最大功率，試計算  $R_L$  之值及其所消耗之功率。(10%)
- 圖二電路中的開關已閉合很久，在  $t=0$  時開啟，試計算  $t>0$  時之電流  $i(t)$ 。(15%)

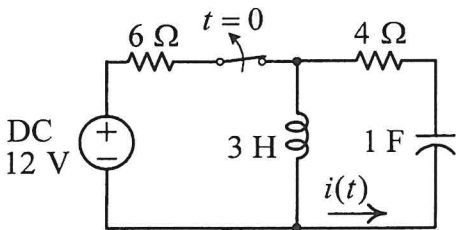


圖一

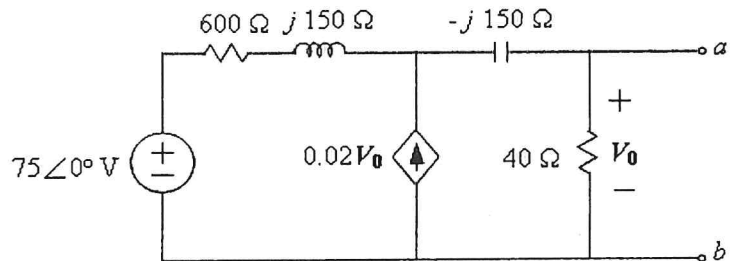


圖二

- 圖三電路中的開關已閉合很久，在  $t=0$  時開啟，試計算  $t>0$  時之電流  $i(t)$ 。(25%)
- 請求出如圖四所示電路  $a-b$  端之戴維寧等效電路，並繪出其等效電路圖。(15%)

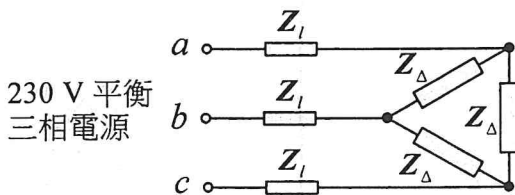


圖三

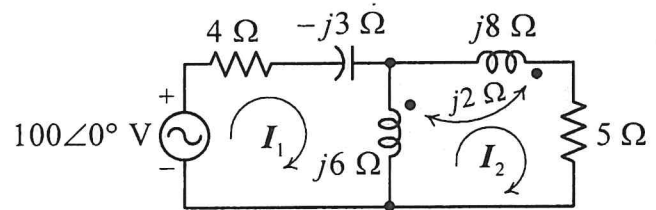


圖四

- 某一平衡三相  $\Delta$ -接負載，其每相阻抗為  $Z_\Delta = 40 \angle 36.87^\circ \Omega$ ，經由線路阻抗為  $Z_l = 0.9 + j1.2 \Omega$  之導線連接於線電壓有效值為 230 V 之平衡三相三線電源，如圖五所示，試回答以下問題：
  - 負載側之線電壓為多少？(10%)
  - 電源側所供應之三相複功率為何？(10%)
- 請計算如圖六所示網路之迴路電流  $I_1$  和  $I_2$  分別為多少？(15%)



圖五



圖六



1. (15%) Solve the general solution of the following differential equations:  
 [解下列微分方程式之通解]
  - (1)  $y' = 10e^{2x}$  (5 分);
  - (2)  $xy' + 2y = 2$  (5 分);
  - (3)  $\frac{dy}{dx} = 1 + e^{(y-x+1)}$  (5 分).
2. (10%) Solve  $x^2 y'' - xy' + y = 2x$  [求 Cauchy-Euler Equation 之通解].
3. (15%) Find the Laplace transform or inverse transform of the following functions:
  - (1)  $f(t) = 4t^2 - e^{-3t} + 5 \sin 3t$ ; 求  $F(s) = L[f(t)]$  (5 分);
  - (2)  $f(t) = t \int_0^t \sin t \, dt + \int_0^t \sin \tau \cos(t-\tau) \, dt$ ; 求  $F(s) = L[f(t)]$  (5 分);
  - (3)  $F(s) = \frac{e^{-2s}}{s(s-1)(s+1)}$ ; 求  $f(t) = L^{-1}[F(s)]$  (5 分).
4. (10%) Use the Laplace transform to solve the given initial value problem [利用拉氏轉換求解以下微分方程式]:  $\frac{dy(t)}{dt} - y(t) = te^t \sin t$ ,  $y(0) = 0$ .
5. (20%) Let A and B be  $n \times n$  matrices. B is similar to A. Prove that the two matrices both have the same characteristic polynomial and consequently both have the same eigenvalues.
6. (20%) Solve the system
 
$$\begin{aligned} \dot{y}_1(t) &= 3y_1(t) + 4y_2(t) \\ \dot{y}_2(t) &= 3y_1(t) + 2y_2(t) \end{aligned}$$
 with  $y_1(0) = 6$ ,  $y_2(0) = 1$   
 Find  $Y = \begin{bmatrix} y_1(t) \\ y_2(t) \end{bmatrix}$
7. (10%) Which of the following collections of vectors are linearly independent in  $R^3$  ?
  - (a)  $[1,1,1]^T, [1,1,0]^T, [1,0,0]^T$
  - (b)  $[1,2,4]^T, [2,1,3]^T, [4,-1,1]^T$