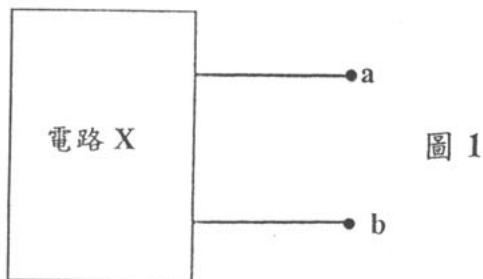
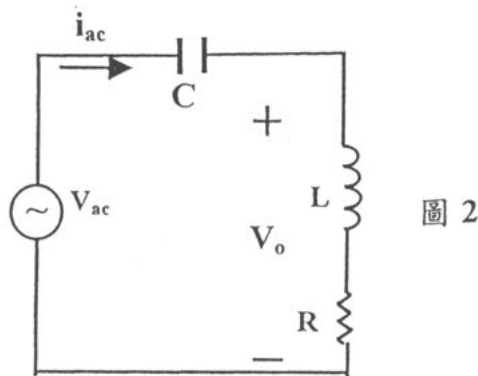


1. 請說明三相電力系統相較於單相電力系統之優點?[5%]
2. 有一台 110V/480V, 10 kVA 的變壓器, 若將二次側的負載完全移除, 經過一段時間之後, 發現此變壓器的溫度高於環境溫度 10°C , 請說明此現象。[5%]
3. 為何許多變壓器的鐵心是用許多薄片堆疊而成? [5%]
4. 請說明直流馬達、同步馬達、及感應馬達結構上的基本差異(電樞、磁場), 並說明其個別之優缺點? [10%]
5. a) 何謂 Thevenin 等效電路及 Norton 等效電路? b) 圖 1 之電路 X 是相當複雜的電路, 請說明如何將此電路 X 轉換為 Thevenin 等效電路及 Norton 等效電路 [10%]



6. 圖 2 為交流電壓接至 L-C-R 負載, 其中 $V_{ac}=100 \sin 20t \text{ V}$, 若電流 $i_{ac}=10 \sin 20t \text{ A}$, $L=40 \text{ mH}$.
 a) 請問電阻值 R 為何? b) 算出 V_o 平均輸出電壓? c) 若將電感 L 置換為 $L=20 \text{ mH}$ 之電感, 求出電源端量到的功率因素為何? [15%]



7. The state-space representation of the transfer function $G(s) = \frac{Y(s)}{U(s)} = \frac{s+1}{s^3+2s^2+4s+6}$ has the following form

$$\dot{x} = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 2 \\ a & b & c \end{bmatrix} x + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$
$$y = [d \quad e \quad f] x$$

Find $a, b, c, d, e,$ and f . [10%]

8. A DC motor has the following characteristics. When the speed is 200 (rad/sec), the torque is 40 (N-m). When the speed is 100 (rad/sec), the torque becomes 60 (N-m). Find the stall torque of the motor. [10%]

9. Consider the system described by

$$T(s) = \frac{12}{s^2 + 4s + 6}$$

Determine the unit step response of the system and find the maximal value of the response. [10%]

10. Explain the following terms [20% total, 4% each]

- PID control
- Phase margin
- Steady-state error
- Sensitivity
- Root locus