電路學（二）期末考　　06/17(四) 13:15-14:30

1. (a) Given $\mathbf{G}_1(s)=\dfrac{2}{s^2+2s+2}=\dfrac{K_1}{s+1-j1}+\dfrac{K_1^*}{s+1+j1}$, find K_1. (6%)

   (b) Given $\mathbf{F}_1(s)=\dfrac{2}{s+2}+\dfrac{2}{s+3}$, $\mathbf{F}_2(s)=e^{-2s}\mathbf{F}_1(s)$, find $f_2(t)$. (6%)

   (c) Use **initial value** and **final value theorems** to find the initial and final values of $f(t)$ if

   $$\mathbf{F}(s)=\frac{2s^2+s+1}{s(s^2+4s+4)}$$ (10%)

2. Find and use the transfer function $\mathbf{H}(s)=\mathbf{V}_o(s)/\mathbf{V}_i(s)$ of the circuit shown in Fig. 2 to determine the **steady-state response** $v_{oss}(t)$ if $v_i(t)=10\cos 5t$ V. (22%)

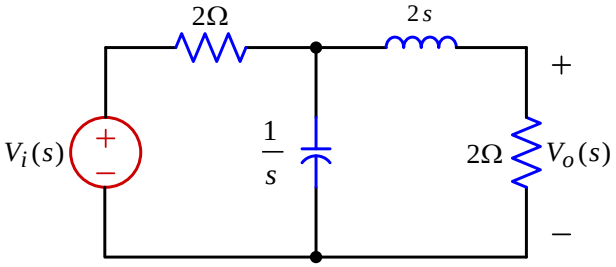

Fig. 2

3. 電動車等效模型如 Fig.3，此電路由電壓源 $v(t)$ 驅動，$v(t)$ 之傅立葉級數如下：

$$v(t)=\sum_{\substack{n=1\\ n\,\text{odd}}}^{\infty}\frac{10}{n\pi}\sin n\omega_0 t$$

   (a)畫出 $v(t)$ 前 2 項的振幅(amplitude)與(phase)相角頻譜(12%)

   (b)使用 $v(t)$ 前 2 項求出 $i(t)$ $(\omega_0=1000)$ (12%)

   (c)計算吸收的平均功率(12%)

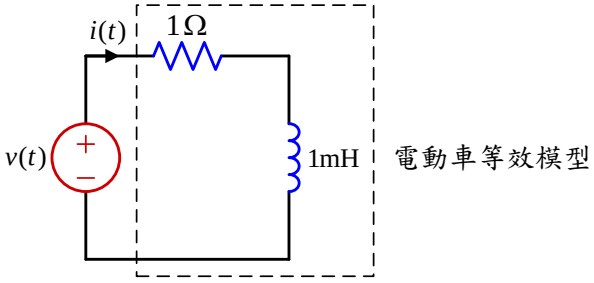

Fig. 3

4. 求出 Fig. 4 雙埠網路的阻抗參數，寫出詳細計算過程，並注意單位(20%)

$$\begin{bmatrix}\mathbf{V}_1\\ \mathbf{V}_2\end{bmatrix}=\begin{bmatrix}\mathbf{z}_{11} & \mathbf{z}_{12}\\ \mathbf{z}_{21} & \mathbf{z}_{22}\end{bmatrix}\begin{bmatrix}\mathbf{I}_1\\ \mathbf{I}_2\end{bmatrix}$$

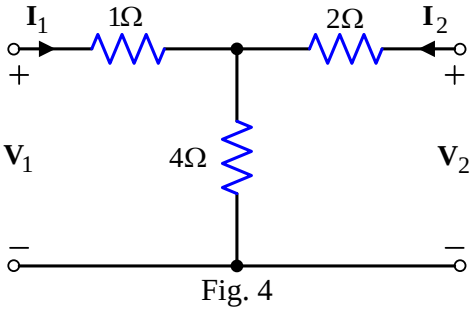

Fig. 4