電路學（二）期末考解答

1. (a) $K_1 = \left.\dfrac{2}{(s+1+j1)}\right|_{s=-1+j1} = 1\angle -90°$ (6%)

(b) use the time shifting property. $f_2(t) = 2\left(e^{-2(t-2)} + e^{-3(t-2)}\right)u(t-2)$ (6%)

(c) $f(0) = \lim\limits_{s\to\infty} s\mathbf{F}(s) = \lim\limits_{s\to\infty} \dfrac{2s^2+s+1}{s^2+4s+4} = 2$, $f(\infty) = \lim\limits_{s\to 0} s\mathbf{F}(s) = \lim\limits_{s\to 0} \dfrac{2s^2+s+1}{s^2+4s+4} = \dfrac{1}{4}$ (10%)

2.

$\mathbf{Z} = \dfrac{1}{s} // (2s+2) = \dfrac{2s+2}{2s^2+2s+1}$

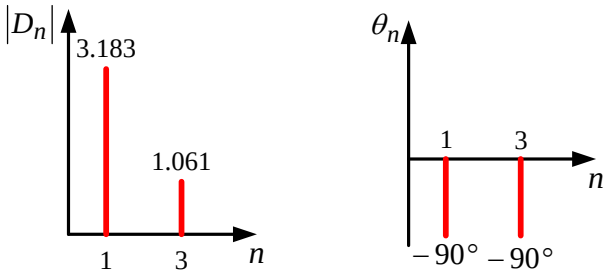
$\mathbf{V}_o(s) = \mathbf{V}_i(s) \times \dfrac{\mathbf{Z}}{2+\mathbf{Z}} \times \dfrac{2}{2s+2} = \dfrac{1}{2s^2+3s+2}\mathbf{V}_i(s) \Rightarrow \mathbf{H}(s) = \dfrac{1}{2s^2+3s+2}$ (10%)

$\mathbf{H}(j5) = \dfrac{1}{2(j5)^2+3(j5)+2} = 0.02\angle -162.6°$ (6%)

$v_{oss}(t) = 0.2\cos(5t - 162.6°)\ \text{V}$ (6%)

3.(a)計算過程 8%、振幅與相角頻譜 4% ($D_n \angle \theta_n = a_n - jb_n$)

n	a_n	b_n	$\lvert D_n\rvert$	θ_n(°)
1	0	3.183	3.183	-90
3	0	1.061	1.061	-90



(b) $\omega_0 = 1000$

$n=1$, $n\omega_0 = 1000$, $\mathbf{Z}_1 = 1+j1$ (3%)

$n=3$, $n\omega_0 = 3000$, $\mathbf{Z}_3 = 1+j3$ (3%)

$\mathbf{I}_1 = \dfrac{3.183\angle -90°}{\mathbf{Z}_1} = 2.25\angle -135°$, $\mathbf{I}_3 = \dfrac{1.061\angle -90°}{\mathbf{Z}_3} = 0.36\angle -161.6°$ (4%)

$i(t) = 2.25\cos(1000t - 135°) + 0.36\cos(3000t - 161.6°)\ \text{A}$ (2%)

※一定要依不同頻率算出阻抗，否則至少扣一半的分數

(c) $P = \dfrac{3.183\times 2.25}{2}\cos(45°) + \dfrac{1.061\times 0.36}{2}\cos(71.6°) = 2.592\text{W}$ (12%)

4. $\begin{bmatrix}\mathbf{V}_1\\ \mathbf{V}_2\end{bmatrix} = \begin{bmatrix}5 & 4\\ 4 & 6\end{bmatrix}\begin{bmatrix}\mathbf{I}_1\\ \mathbf{I}_2\end{bmatrix}$, 單位是 Ω (20%)

※必須寫出計算過程。