國立臺灣大學 105 學年度碩士班招生考試試題

1. The circuit shown in Figure. 1 has two sources, $i(t) = 2\cos(20t+180^0)$ A and $v(t) = 80\cos(20t)$ V.
   a) Determine the inductor current $i_L(t)$ and the resistor current $i_R(t)$. [20]
   b) Draw the phasor diagram of the inductor and resistor currents. [5]

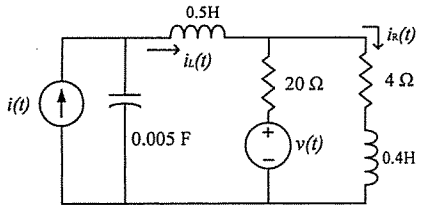

Figure 1

2. The circuit shown in Figure 2 has two voltage sources. $v_1(t)= 4u(t)$ V where $u(t)$ is the unit step function ($u(t)=0$ for $t<0$ and $u(t)=1$ for $t\geq 0$). $v_2(t)= 1$ V for $t<0$ and is disconnected (removed) from the circuit at $t = 0$. Please determine the capacitor voltage $v_C(t)$ for $t>0$. [25]

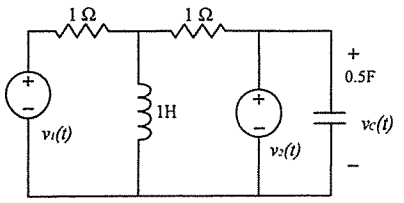

Figure 2

3. Construct the asymptotic Bode plot of the **gain** and **phase** for the transfer function :
   $H(s)=\dfrac{100s\cdot(50+s)}{(400+s)(100+s)^2}$ (Note: critical points and slopes must be specified) [25]

4. A difference amplifier using an ideal operational amplifier powered by ±12 V is shown in Figure 3. The resistor values (R_1, R_2, R_3, and R_4) and input voltages ($v_1(t)$ and $v_2(t)$) for different operation cases are shown in Table A. Please determine the output voltage $v_o(t)$ for Case 1 and Case 2. [25]

Table A

	R_1 (Ω)	R_2 (Ω)	R_3 (Ω)	R_4 (Ω)	$v_1(t)$ V	$v_2(t)$ V
Case 1	110k	660k	220k	440k	5.2	0.8
Case 2	100k	110k	440k	800k	7.6	0.4

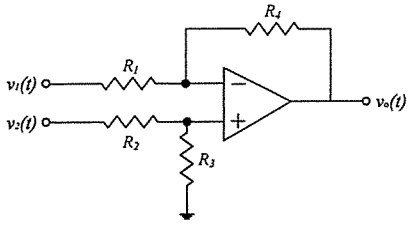

Figure 3

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