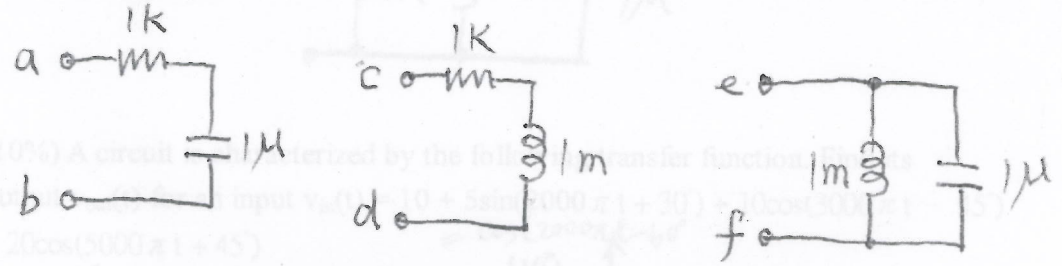
CS2101 Circuits and Electronics Midterm #2

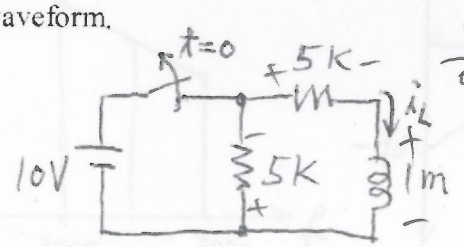
NOTE: 每一題都要寫出計算過程

1. (20%) For a sinusoidal signal $v(t) = 10\cos(100\pi t + 45^\circ)$
   A. What is its peak value? 10
   B. What is its root-mean-square value? $5\sqrt{2}$
   C. What is its frequency? 50
   D. What is its angular ferquency? 100π
   E. Express it in phasor form.
   F. How much power is consumed if it is applied to a 10Ω resistor?
   G. How much power is consumed if it is applied to a 1μF capacitor? 0

2. (15%) Find equivalent impedance Z_{ab}, Z_{cd}, and Z_{ef} when the working frequency $f = 1000/2\pi$ Hz.

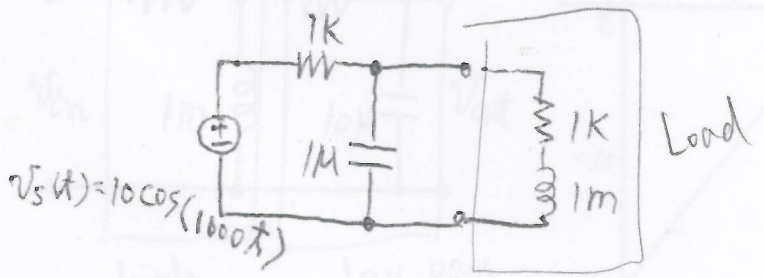


3. (15%) For the circuit below,
   A. What is $i_L(t^+)$?
   B. Draw its waveform.



$\frac{5\times5}{5+5} = 2.5$

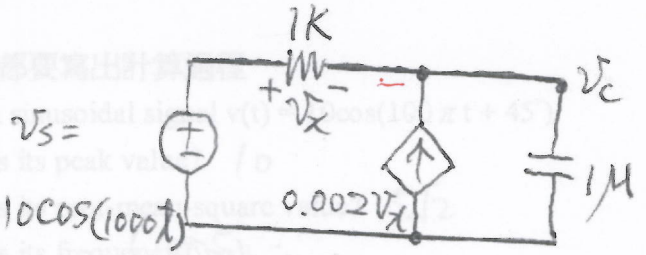
4. (15%)
   A. Find the Thevenin equivalent circuit
   B. Calculate power delievred to the load (combination of R and L).
   C. What is the power factor?



$|1050 - 49j|$

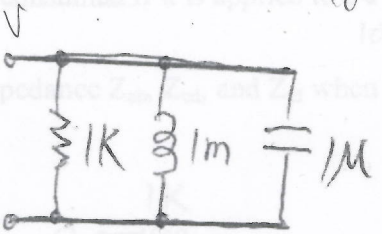
$= \sqrt{1104910} = 1051$

5. (10%) Find steady-state $v_C(t)$ of the following circuit.



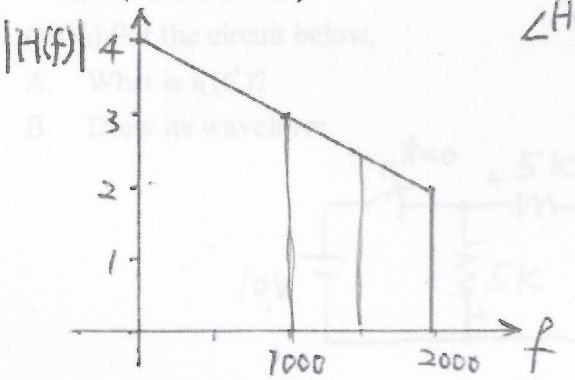
6. (10%) Find the resonant frequency of the circuit below.

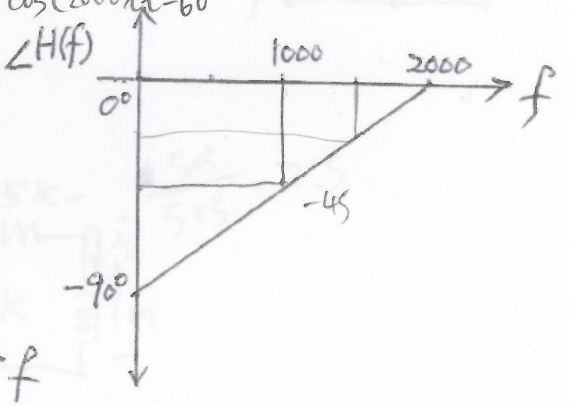
$f_0 = \frac{1}{2\pi\sqrt{LC}}$



7. (10%) A circuit is characterized by the following transfer function. Find its output $v_{out}(t)$ for an input $v_{in}(t) = 10 + 5\sin(2000\pi t + 30^\circ) + 10\cos(3000\pi t - 45^\circ) + 20\cos(5000\pi t + 45^\circ)$

$= \cos(2000\pi t - 60^\circ$





8. (15%) Treat the circuit below as cascade of two filers. Determine the values of R_1 and R_2 such that the transfer function as shown in the Bode Plot is obtained.