1. As shown in Figure 1, an ideal op-amp supplied by ±15V, is used to realize a summation function which can be described as: $Vo = -(4V_3+2V_2+V_1)$. Please answer the following questions:
a) determine the resistances of R_1, R_2 and R_3. [5%]
b) determine the power consumption of this circuit (excluding the op-amp) when the input voltages are: V_1=1V, V_2=0V, and V_3=1V. [5%]

2. A voltage source, $v(t)$=20 cos(377t+45^0) V, is applied to a series connected R-L load with R=5Ω and L=0.2H. Please determine the load current $i(t)$. [10%]

3. The switch SW opens at t = 0 after been closed for a long time, as shown in Figure 2. Please determine: a) the initial inductor current, $i_L(0^+)$, when the switch is opened [5%]; b) the capacitor voltage, $v_c(t)$, for $t > 0$. [15%]

4. Please draw the asymptotic Bode plot of the gain and phase for the transfer function: [20%]

$$H(s) = \frac{5(s^2 + 55s + 250)}{s^3 + 520s^2 + 10000s}$$

5. Two parallel connected loads, Load 1: 50kW with power factor 0.75 lagging and Load 2: 25kW with power factor 0.88 lagging, are both connected to a 220Vrms 60Hz voltage source. Please determine:
a) the reactive power of Load 2, [5%]
b) the current flow through Load 1, [5%]
c) the overall power factor of Load 1 and Load 2, [5%]
d) the require capacitance, which is connected in parallel to these two loads, to improve the overall power factor to 0.95 lagging. [5%]

6. A first-order non-inverting lowpass filter with 20dB DC gain and 50kHz cut-off frequency is demanded to attenuate the high frequency noise of a voltage signal. Please show your designed circuit and explain that your designed circuit can meet the requirement. [20%]

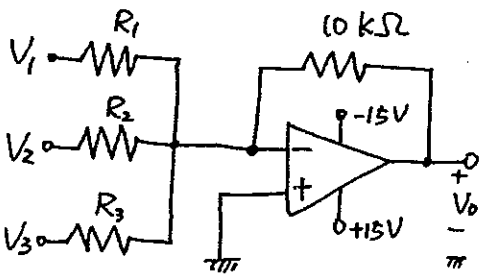

Figure 1

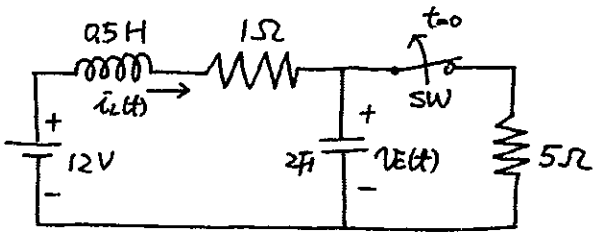

Figure 2

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