1.

Find the power associated with the dependent source in the follow circuit. (10%)
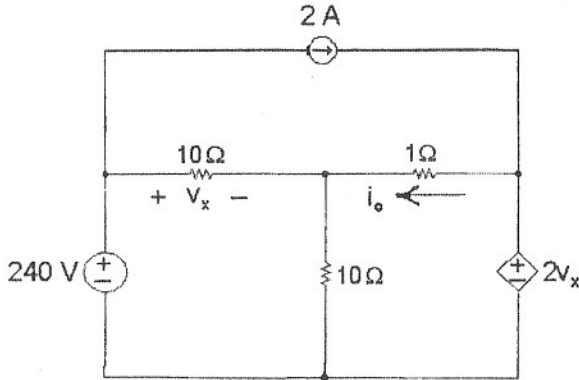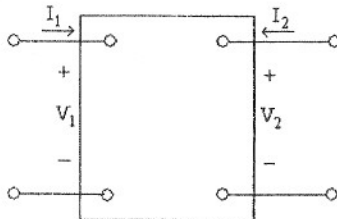

2.

The following dc measurements were made on the two-port network shown below. Which parameters are easiest to find from the measurements? (3%) Find the values of them. (12%)

Open-circuit Port 2	**Short-circuit Port 2**
Apply $V_1 = 20$ mV	Apply $V_1 = 10$ V
Measure $I_1 = 0.25$ μA	Measure $I_1 = 200$ μA
Measure $V_2 = -5$ V	Measure $I_2 = 50$ μA

$V_1 = z_{11}I_1 + z_{12}I_2$　　$I_1 = y_{11}V_1 + y_{12}V_2$　　$V_1 = h_{11}I_1 + h_{12}V_2$　　$I_1 = g_{11}V_1 + g_{12}I_2$　　$V_1 = a_{11}V_2 - a_{12}I_2$　　$V_2 = b_{11}V_1 - b_{12}I_1$

$V_2 = z_{21}I_1 + z_{22}I_2$　　$I_2 = y_{21}V_1 + y_{22}V_2$　　$I_2 = h_{21}I_1 + h_{22}V_2$　　$V_2 = g_{21}V_1 + g_{22}I_2$　　$I_1 = a_{21}V_2 - a_{22}I_2$　　$I_2 = b_{21}V_1 - b_{22}I_1$

3.

Find the no-load voltage (5%) and load voltage (5%) for $R_L = 5$kΩ.
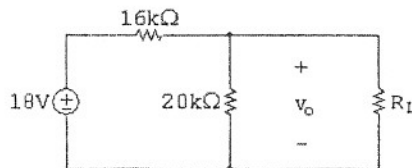
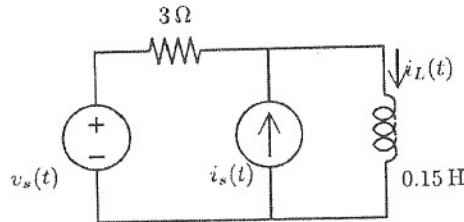4. (15%) Use the superposition technique, find the inductor current $i_L(t)$ at steady state. $v_s(t) = 5\cos(26.66t)$ V, $i_s(t) = 10\sin(20t)$ A. **Note $\cos(53.1°) \approx 0.6$.**

5. (20%) In the given circuit, $V_s = 120\angle(10°)$ V(rms), $I_1 = 2\angle(40°)$ A(rms), $I_2 = 3\angle(-35°)$ A(rms).

    (a) Find the impedances Z_1 and Z_2.

    (b) Calculate the complex power, the average power, and the reactive power of Z_1 and Z_2 respectively.

    (c) To compensate the power factor of the total load (Z_1 and Z_2) into 1.0, what component is needed (L or C)? Please calculate its impedance.
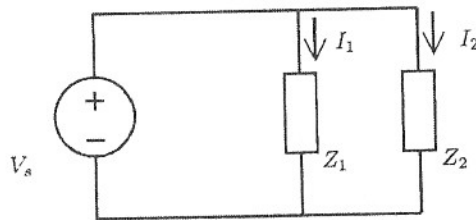
6. The following circuit has been in steady state for a long time at t=0. The switch S is opened at t=0. Find $i_L(0^+)$ and $i_L(t)$ for t $\geq$ 0^+. (15%)
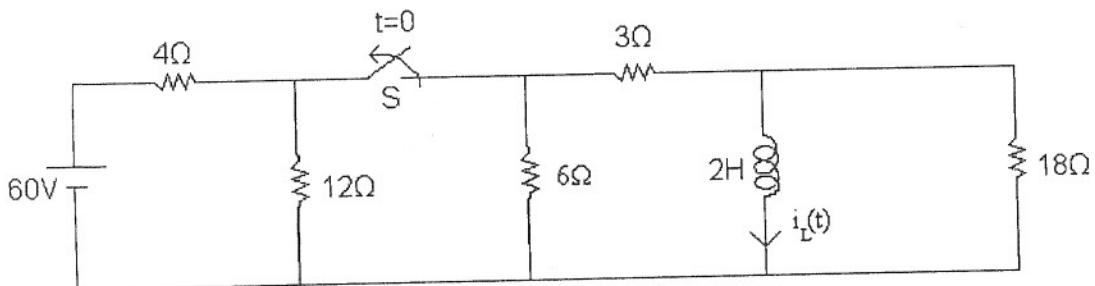
7. Find the steady state solution of $V_x(t)$ and $i_2(t)$ for the following circuit. Given $L_1=L_2=M=4H$, $C=1F$, $V_{S1}(t) = V_m\cos(t+\theta_1)$ volts, $V_{S2}(t) = 10\cos(t+90°)$ volts where $V_m\cos\theta_1+j\,V_m\sin\theta_1=4+j20$. (15%)