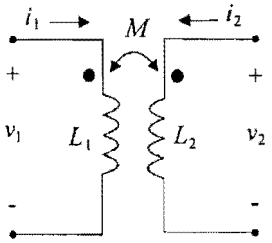
請勿在本試題紙上作答，否則不予計分

Problem #1: (14 points, 2 pts each) Please write your answers on the answer sheet

Use the passive sign convention and the dot conventions to write expressions for the voltage (v), current (i), power absorbed (p), or energy stored (w), as specified by each of the problems below.

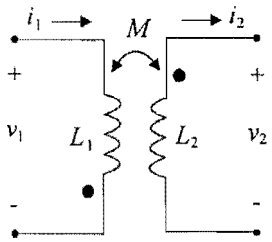
a.



v_1 = _____

v_2 = _____

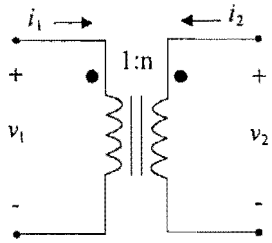
b.



v_1 = _____

v_2 = _____

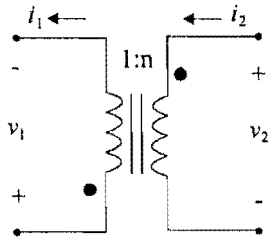
c.



v_2/v_1 = _____

i_2/i_1 = _____

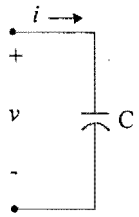
d.



v_2/v_1 = _____

i_2/i_1 = _____

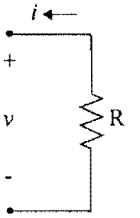
e.



i = _____

w = _____

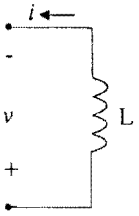
f.



v = _____

p = _____

g.



v = _____

p = _____

(背面仍有題目,請繼續作答)

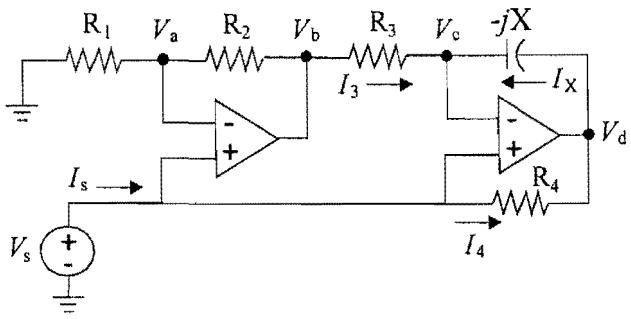
Problem #2: (10 points, 1 pts each)

Please write either *True* (T) or *False* (F) on the answer sheet for the following questions.

a. By convention, the direction of current is defined as the direction of positive charge flow.
b. The passive sign convention is satisfied if the labeled current is leaving the terminal labeled with the negative polarity, "-".
c. An ideal current source that produces a current of 0 A is equivalent to a short circuit.
d. Kirchhoff's laws tell us how the voltage and current within a circuit element are related.
e. Phasors are complex numbers that represent the phase and amplitude of sinusoidal signals.
f. Any two terminals in a circuit containing operational amplifiers, dependent sources, independent sources, and resistors is electrically equivalent to a Norton equivalent current source in parallel with the Norton equivalent resistance.
g. The "real" model of operational amplifiers is less accurate that the "ideal" model, but we use the "real" model because it simplifies analysis.
h. Capacitors, inductors, and dependent sources are called "energy storage" elements because they cannot dissipate or produce power.
i. The ideal model of an operational amplifier has an infinite input resistance and gain.
j. Source transformations combined with phasors enable us to solve for the steady-state response of circuits containing independent sinusoidal sources operating at different frequencies.

Problem #3: (16 points)

Your answers to the following questions **should include** the voltage V_s and **should not include** the voltages V_a, V_b, V_c, or V_d, or the currents I_3, I_X, I_s, or I_4, unless otherwise specified.



a. (4 pts) Write expressions for V_a, V_b, and V_c.
b. (2 pts) Write an expression for I_3.
c. (2 pts) Write an expression for V_d.
d. (2 pts) Write an expression for I_4.
e. (2 pts) Write an expression for I_4. Your answer should not include V_s and should include I_s.
f. (2 pts) What is the equivalent impedance seen by the voltage source? Your answer should not include V_s or I_s.
g. (2 pts) What type of circuit element does this equivalent impedance resemble? Choose one.
Resistor Inductor Capacitor Linear Transformer

Problem #4: (10 points, 5 pts each)

(a) A series *RLC* circuit contains a resistor $R = 3\ \Omega$ and a capacitor $C = 4$ F. Select the value of the inductor so that the circuit is critically damped.

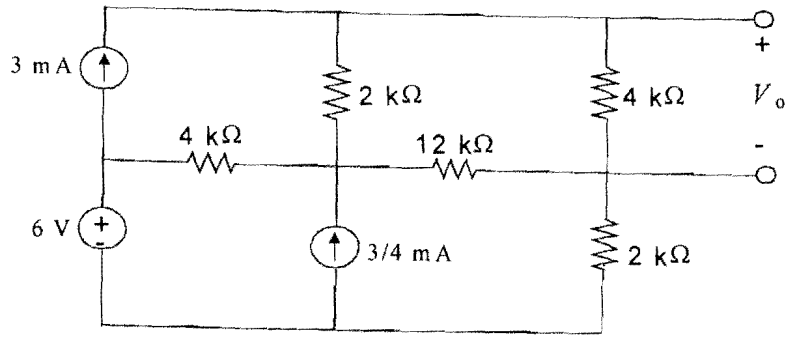
(b) Design a parallel *RLC* circuit with $R \geq 1\ \text{k}\Omega$ that has the characteristic equation

$$s^2 + 2\times10^7 s + 2\times10^{14} = 0$$

If we let $R = 1\ \text{k}\Omega$, please find the values of L and C.

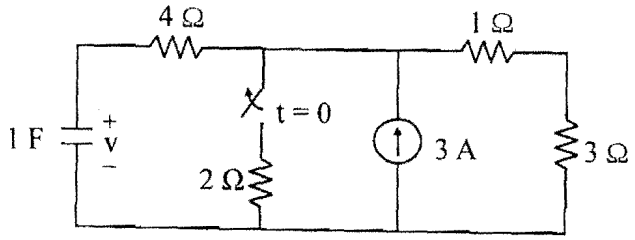
Problem #5: (20 points)

Find V_o in the figure using Thevenin's theorem.



Problem #6: (15 points)

Find v for t > 0 if the circuit is in steady state at t = 0⁻ in the network shown.



Problem #7: (15 points)

Find the AC steady state voltage v in the network shown.