※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Problem #1: (20 points) (2 pts each)

Use the circuit as shown in Fig. 1 to answer the following questions.

(a) Use superposition to find the current that flows from terminal *a* to *b* when the terminals are connected (short-circuit) due to the voltage source acting alone.

(b) Use superposition to find the current that flows from terminal *a* to *b* when the terminals are connected (short-circuit) due to the current source acting alone.

(c) Find the Norton equivalent current.

(d) If the current source produced twice as much as current as shown, what would the Norton equivalent current be? Hint: linearity.

(e) If the polarity of the voltage source was reversed, what would the Norton equivalent current be?

(f) Find the Thevenin/Norton equivalent resistance of the circuit.

(g) Find the Thevenin equivalent voltage.

(h) Draw **both** the Thevenin **and** Norton equivalents of the circuit as seen from the nodes *a* and *b*. Clearly label these nodes.

(i) Suppose a resistor R_L is connected to the nodes *a* and *b*. What value of R_L will maximize the power delivered to R_L? What is the maximum power that can be delivered to R_L.

(j) Is this equal to half of the power produced by the voltage source and current source in the original circuit?

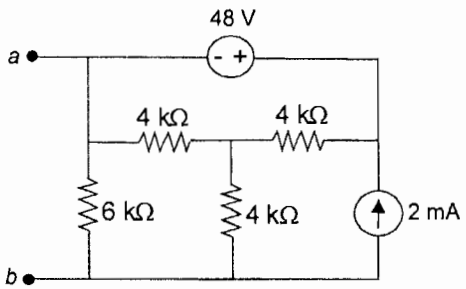

Fig. 1

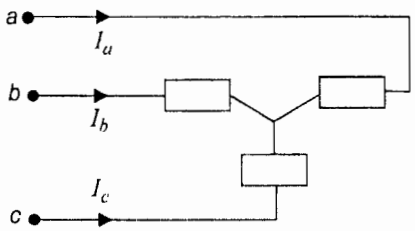

Fig. 2

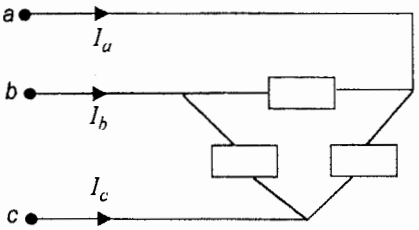

Fig. 3

Problem #2: (20 points)

A three-phase wye connected load is rated at 120 volts, 120 kVA with power factor 0.0 (leading) as shown in Fig. 2. Compute (a) the load current and corresponding phase angles. (b) the real and reactive power of the load at its rated condition.

Problem #3: (20 points)

A three-phase delta connected load is rated at 240 volts, 240 kVA with power factor 0.95 (lagging) as shown in Fig. 3. Compute (a) the line currents (in polar form). (b) The phase currents. (c) the real and reactive power of the load at its rated condition. Hint: $cos(18.19^o) = 0.95$.

(背面仍有題目,請繼續作答)

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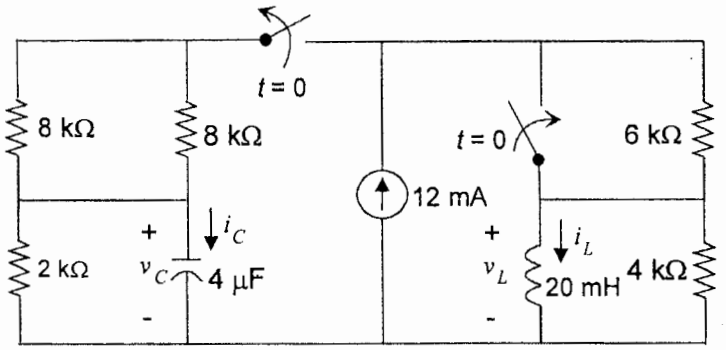
Problem #4: (20 points) (10 pts each)

(a) Draw the circuit diagram of inverting & non-inverting amplifier and derive the expression for the output voltage.

(b) Draw the circuits and derive the expressions for the integrator and differentiator using op-amp.

Problem #5: (20 points)

Use the circuit below to answer the following questions. The switches have been in their initial position for a long time.



a. (10 pts) Fill in the table below. Remember to include units with your answers.

Immediately before $t = 0$. $t = 0^-$	Immediately after $t = 0$. $t = 0^+$	Long after $t = 0$. $t \to \infty$
$i_L =$	$i_L =$	$i_L =$
$v_L =$	$v_L =$	$v_L =$
$i_C =$	$i_C =$	$i_C =$
$v_C =$	$v_C =$	$v_C =$

b. (2 pts) What is the time constant for the portion of the circuit that contains the inductor?
c. (2 pts) What is the time constant for the portion of the circuit that contains the capacitor?
d. (2 pts) Write the expression for the voltage across capacitor for $t \geq 0$.
e. (2 pts) Write the expression for the current across inductor for $t \geq 0$.
f. (2 pts) Write the expression for the energy stored in the inductor for $t \geq 0$.