國立成功大學 105 學年度碩士班招生考試試題

系　　所：電機工程學系

考試科目：電路學

考試日期：0227，節次：1

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

1. The circuit is shown in Fig. 1 with the following component values

   $R_1 = 1\ k\Omega$, $R_2 = 1000\ k\Omega$, $R_3 = 10\ k\Omega$, $R_4 = 100\ k\Omega$, $R_5 = 1\ k\Omega$, $R_6 = 2\ k\Omega$, and $A = 10000$.

   (a) Find the input equivalent resistance R_{in}. (10%)

   (b) Find the output equivalent resistance R_{out}. (10%)

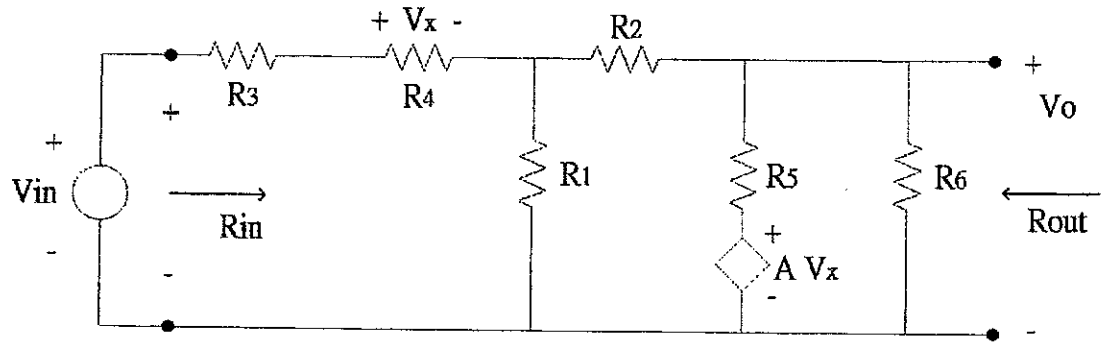

Fig. 1

2. The switch in Fig. 2 has been closed at position A for a long time. It is switched to position B at $t = 0$.

   (a) Find $i(0+)$ and $v(0+)$. (10%)

   (b) Find $i(t)$ and $v(t)$ for $t > 0$. (15%)

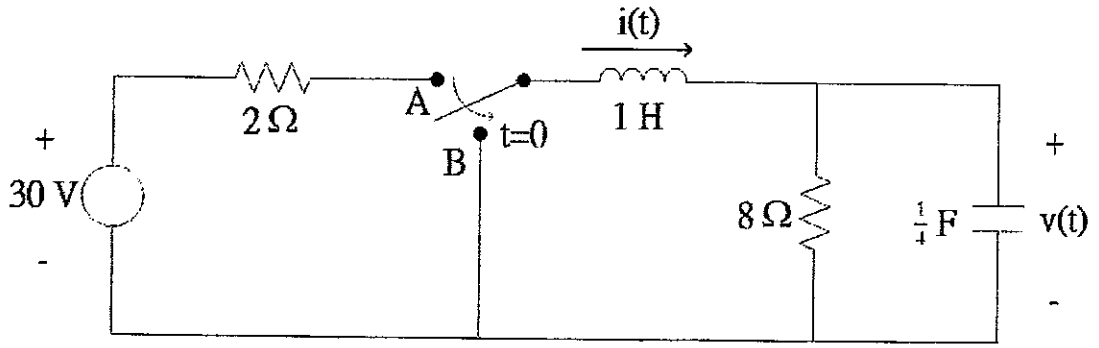

Fig. 2

3. The voltage across a 2-H inductor is $v = 10(1 - t)$ V. Calculate the current flowing through it at $t = 4$ s. Assume $i(0) = 2$ A. (5%)

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4. Fig. 4 shows a three-phase four-wire line with a phase voltage of 120 V rms, with a positive phase sequence, supplying a balanced induction motor at 260 kVA at 0.85 pf lagging and three incandescent lamps. The three incandescent lamps with unity power factor are connected as follows: 24 kW from line *a* to the neutral, 15 kW from line *b* to the neutral, and 9 kW from line *c* to the neutral.

(a) Obtain the readings of the three wattmeters (W_a, W_b, and W_c). (10%)

(b) Calculate the three current phasors $\mathbf{I}_a$, $\mathbf{I}_b$, and $\mathbf{I}_c$ flowing through the three incandescent lamps. (10%)

(c) Find the current phasor $\mathbf{I}_n$ in the neutral line. (10%)

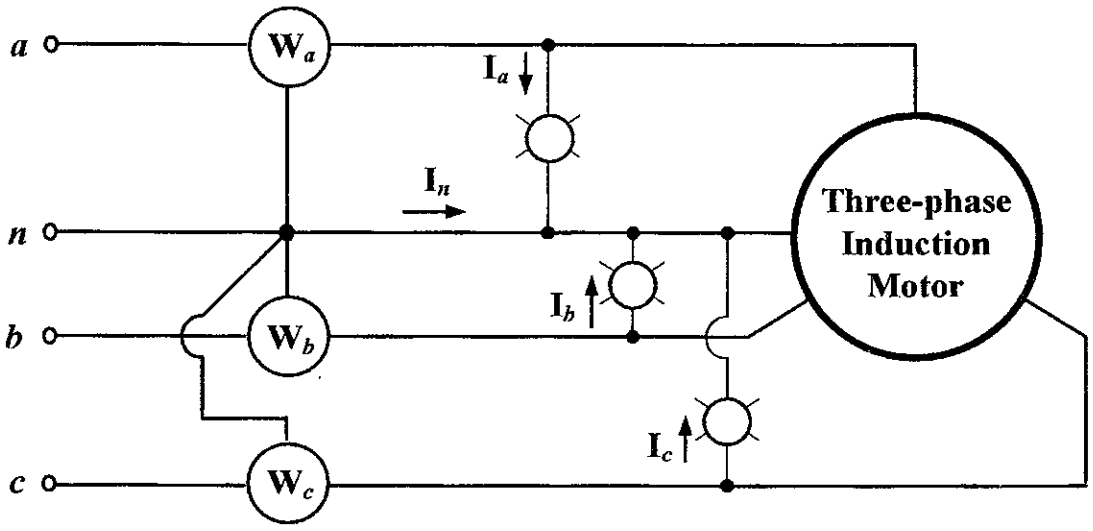

Fig. 4

5. An industrial load is modeled as a series combination of a resistance R and an inductance L as shown in Fig. 5. The measured voltage magnitudes of the three sinusoidal voltages using an ac voltmeter under 60-Hz steady state are: $|\mathbf{V}_s| = 145$ V, $|\mathbf{V}_1| = 50$ V, and $|\mathbf{V}_o| = 110$ V. Calculate the values of L and R. (20%)

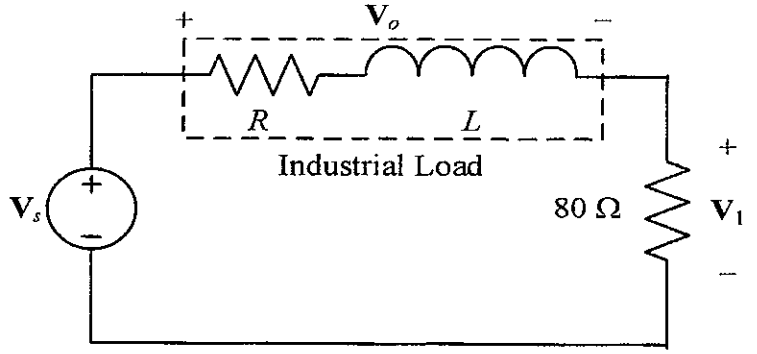

Fig. 5