※ 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。

1. Please translate the following paragraph into Chinese: **(10%)**

Electromagnetics is a branch of electrical engineering that deals with the analysis and application of electric and magnetic fields. It is regarded as one of the more difficult disciplines in electrical engineering. One reason is that electromagnetic phenomena are rather abstract. But if one enjoys working with mathematics and can visualize the invisible, one should consider being a specialist in electromagnetics, since few electrical engineers specialize in this area. The principles of electromagnetics are applied in various allied disciplines, such as electric machines, electromechanical energy conversion, radar meteorology, remote sensing, satellite communications, bio-electromagnetics, electromagnetic interference and compatibility, plasmas, and fiber optics.

2. The circuit shown in Fig. 1 is for AC operation.
   (a) Choose one combination of capacitance C (Farad) and frequency ω (rad/s) from the following list to make the circuit purely resistive: (i) 0.2 F and 33.3 rad/s; (ii) 0.1 F and 3 rad/s; (iii) 0.67 F and 24.7 rad/s; (iv) none of the above. The calculation process must be provided. **(12%)**
   (b) What is this particular frequency called? (written in Chinese is allowed) **(3%)**
   (c) What is the resistance at this frequency? **(3%)**

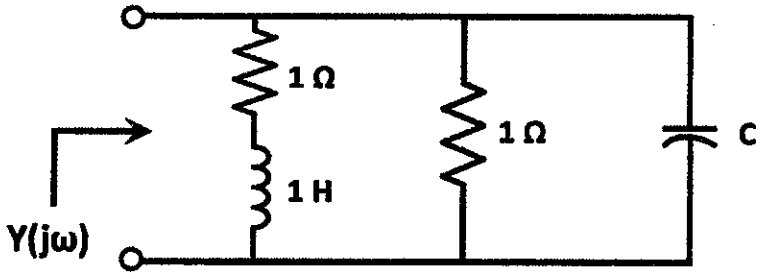

Fig. 1

3. The circuit shown in Fig. 2 has been at steady state before the switch opens at t=0. Determine the *complete solution* of the current *i* for t>0. **(20%)**

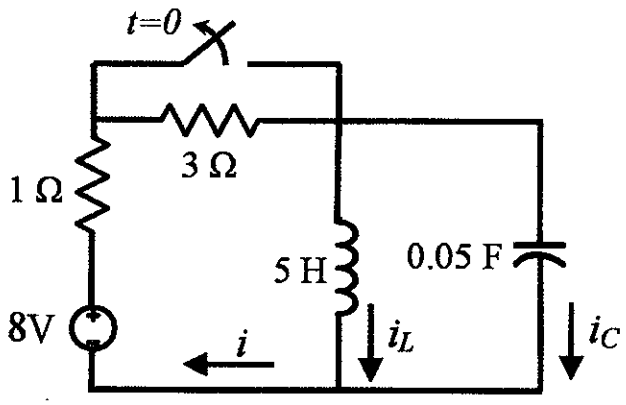

Fig. 2

※ 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。

4. The circuit shown in Fig. 3 operates at ω = 10 rad/s. Please answer the following questions.
   (a) Express the circuit in the box (dotted line) using the Thévenin's equivalent circuit. **(12%)**
   (b) What is the time-average power delivered to the 1.4 Ω resistor? **(4%)**
   (c) For maximum power transfer, what load impedance should be used to replace the 1.4 Ω resistance load? And what is the time-average power transferred in this condition? **(6%)**

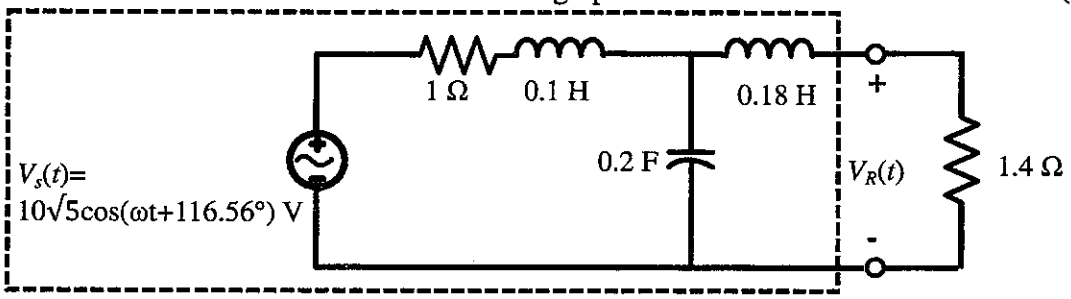

Fig. 3 [Note: tan(116.56°)=-2, tan(36.87°)=0.75, tan(63.44°)=tan(243.44°)=2]

5. The circuit shown in Fig. 4 has two inputs: $V_1(t)$ = 50cos(20t-75°) V and $V_2(t)$ = 35cos(20t+110°) V. When the circuit is at steady state, the node voltage is V(t)= 21.25cos(20t-168.8°) V. Determine the values of R and L. **(20%)**

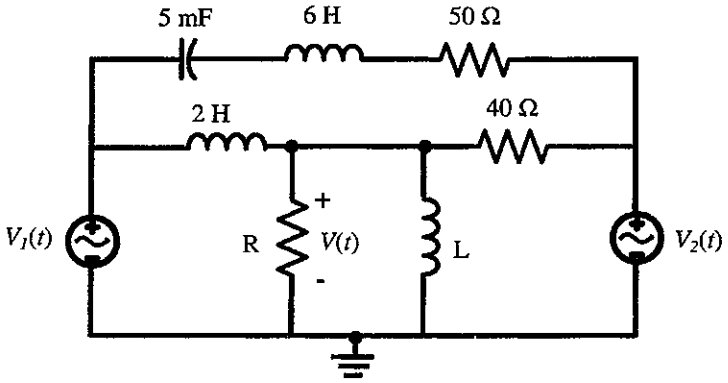

Fig. 4

6. For the circuit shown in Fig. 5, the switch has been closed for a long time and then is opened at t=0. Determine $i_L(t)$. **(10%)**

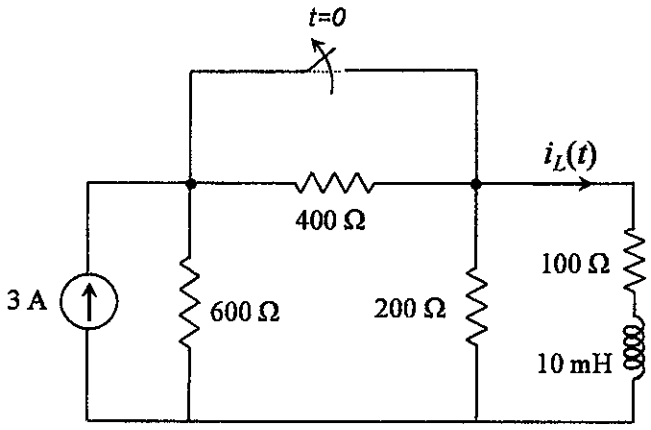

Fig. 5