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科目：電路學
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國立臺灣大學 106 學年度碩士班招生考試試題

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1. (a) For a voltage source $v_s(t) = 10\cos(20t+30^0)$ V, please find the Thevenin's equivalent circuit in **phasor form** for the circuit shown in Figure 1. [10] (b) If a load Z_{load} is connected to the output terminal A-B, please determine the maximum power P_{max} that can be delivered to the load. [10]

2. For the circuit shown in Figurer 2, please use **mesh analysis** to determine the output current I_{out} in phasor form. (Note: using other methods will get no point.) [20]
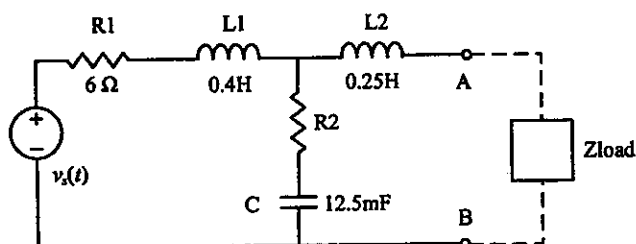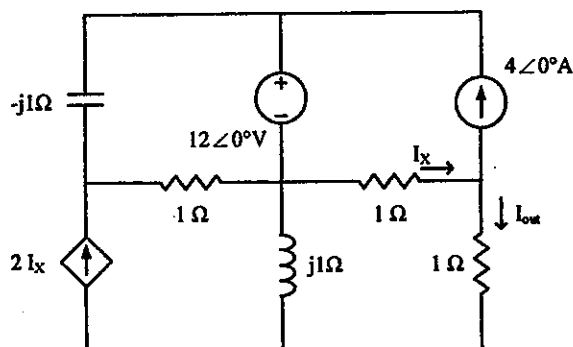

Figure 1

Figure 2

3. An induction motor is operated in the following conditions: single-phase voltage $V_{ac} = 230$ V_{rms}, 60 Hz, 50 kW with power factor 0.8 lagging. Please answer the following questions: (a) What is the apparent power supplied by the source. [5] (b) Determine the value of the required parallel-connected capacitor that can improve the power factor to 0.95 lagging. [7] (c) Draw the power phasor diagram of the motor **before and after** the power factor capacitor is connected. [8]

4. Construct the asymptotic Bode plot of the **gain** and **phase** for the transfer function :

$$H(s) = \frac{100s+10}{10s^2 + s + 10}$$ (Note: critical points and slopes must be specified) [20]

5. For the circuit shown in Figure 3 with the input current

   $i_s(t) = 3$ A for $t < 0$

   $\qquad = -1$ A for $t \geq 0$,

   please answer following questions:

   (a) Draw the s-domain circuit with initial-value sources. [10]

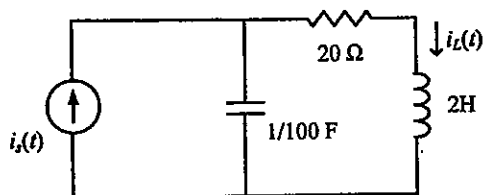   (b) Use Laplace transform to determine the inductor current $i_L(t)$ for $t \geq 0$. [10]

Figure 3

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