國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 工業教育與技術學系　　組別： 乙組　　科目： 電路學

☆☆請在答案卷上作答☆☆　　

1. For Fig. 1, derive the state equations. (10%)

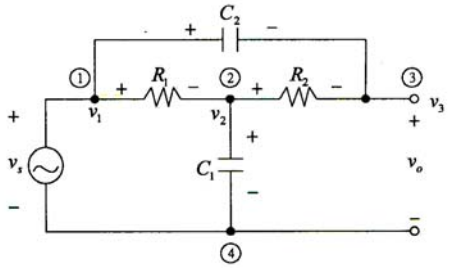

Fig. 1

2. The coil shown in Fig. 2 is modeled as a 10 mH inductor and a 10Ω resistor in series. Assume the switch has been closed for a long time. Determine the current *I* and the energy stored in the coil. If the switch is suddenly open, what will happen for the voltage at the node *B* at that instant (rising, falling or unchanged)? (20%)

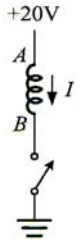

Fig. 2

3. Suppose in Fig. 3 the solar photovoltaic (PV) module has as open-circuit voltage of 90 V and a short-circuit current of 3 A in nooday sun. Assume the solar PV module is a linear circuit, though it may not be a very close approximation. As shown in the figure, the solar PV module is used to charge a battery via a maximum-power tracker for maximum charging power. In the same nooday sun as above, please determine:
   (1) What current should the maximum-power tracker require from the solar PV module? (10%)
   (2) If the efficiency of the maximum-power tracker is 95%, what is the output power of the power tracker? (10%)

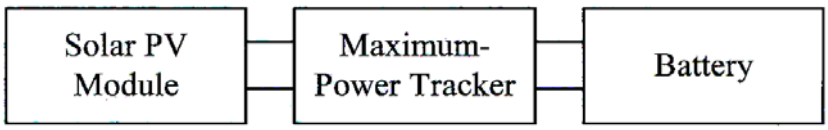

Fig. 3

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4. Find the equivalent impedance of the network of Fig. 4. (15%)

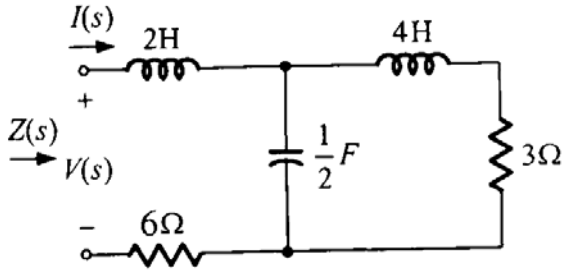

Fig. 4

5. Find the Thévenin equivalent circuits of the network shown in Fig. 5. (20%)

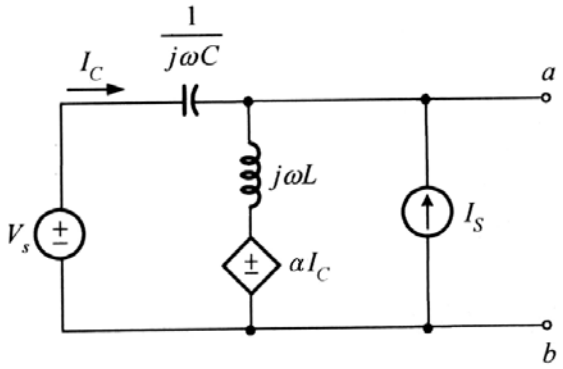

Fig. 5

6. Consider the circuit shown below, suppose $v_C(0) = 2V$ and $v_S(t)$ is the unit-step function, compute $v_C(t)$ for $t \geq 0$. (15%)

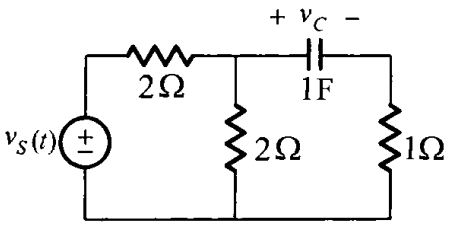

Fig. 6