國立台灣科技大學九十六學年度碩士班招生試題

系所組別： 電子工程系碩士班乙二組

科　　目： 電路學

總分 100 分

1. Determine $i(t)$ in the steady state for the circuit shown in Fig. 1, where $v_1(t) = 2\cos(2000t + 45^\circ)$ V, and $v_2(t) = 6\cos(1000t - 30^\circ)$ V. (10 %)

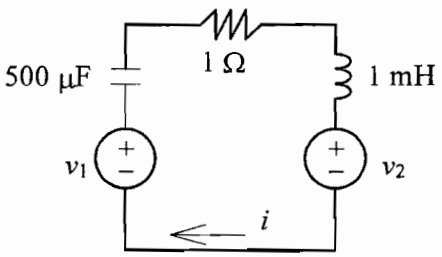

Fig. 1

2. Two coupled coils are connected as shown in Fig. 2. Find the equivalent inductance L_{ab}. (10 %)

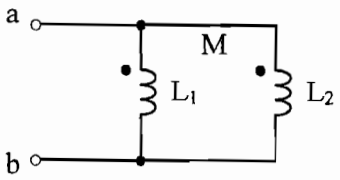

Fig. 2

3. The circuit of Fig. 3 is operating at 10^5 rad/sec. Determine L and the turns ratio n to achieve maximum power transfer to the load. (10 %)

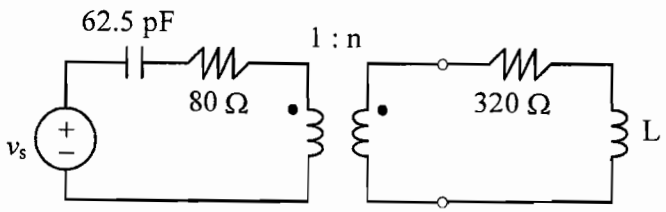

Fig. 3

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4. Find $i(t)$ and $v_c(t)$ in Fig. 4 by Laplace transformation technique, where $v_c(0) = 10$ V and $i(0) = 0$ A. Also please verify the values of $i(0)$, $i(\infty)$, $v_c(0)$ and $v_c(\infty)$ by initial value theorem and final value theorem. (10 %)

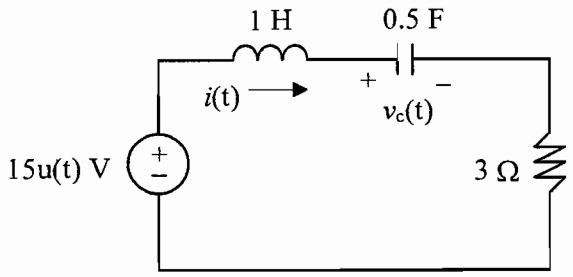

Fig. 4

5. Find the T matrix (transmission matrix or ABCD matrix) for the circuit shown in Fig. 5. (10 %)

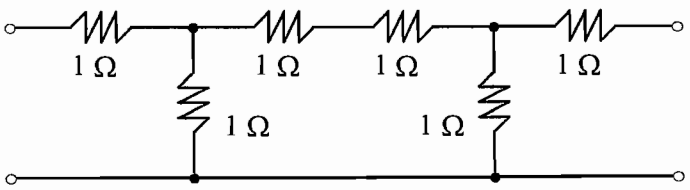

Fig. 5

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6. Please consider the circuit shown in Fig. 6. It is known that $R_S = R_1 = R_4 = R$ and $R_2 = R_3 = 3R$, where R denotes a constant resistance value. Let the power efficiency of this circuit be defined as the ratio of the power dissipated on R_L over the power delivered by the 3V DC source.
(a) Please determine the current i as a function of R_L. (10%)
(b) Please compute the power efficiency of this circuit. (10%)

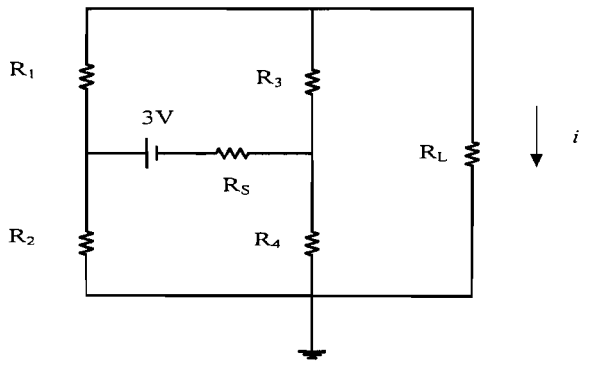

Fig. 6

7. A DC charging circuit is illustrated in Fig. 7. The switch in Fig. 7 is connected at time t = 0. Please determine $v_1(t)$ and $v_2(t)$ for $t \geq 0$. (20%)

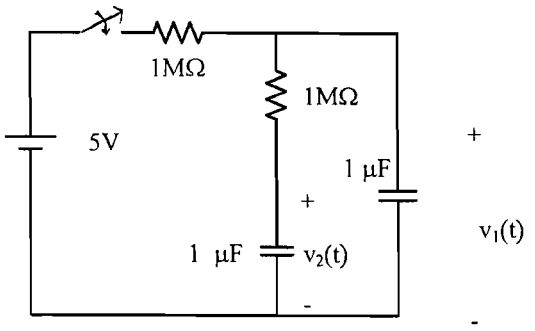

Fig. 7

8. An ideal capacitor with capacitance C is connected in parallel to an ideal inductor with inductance L at time t=0. The capacitor has an initial voltage of 10 V and there is no initial energy stored in the inductor. Please derive an explicit expression for the voltage across the capacitor as a function of time. (10%)