國立臺灣科技大學
九十四學年度碩士班招生考試試題
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. The circled numbers in Figure1 are node numbers. The node voltages of this circuit are v_1=5V, v_2=7V, and v_3=6V. Determine
   (a) The value of the current i_b. (10%)
   (b) The value of the gain r.(10 %)

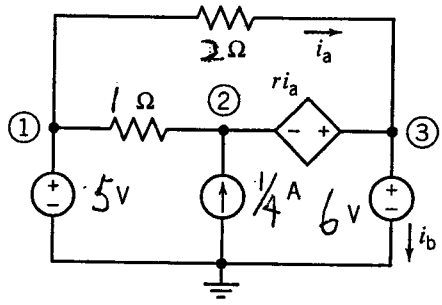

Figure 1

2. Find the Thévenin equivalent circuit for the circuit shown in Figure 2 (10%)

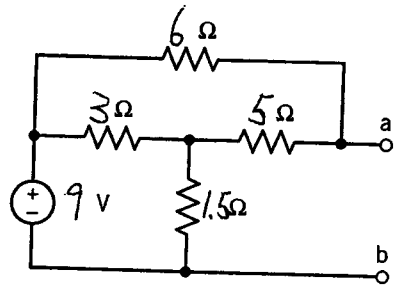

Figure 2

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3. Find $v_c(0^+)$ and $dv_c(0^+)/dt$ if $v_c(0^-)$=30V for the circuit of Figure 3 (10%)

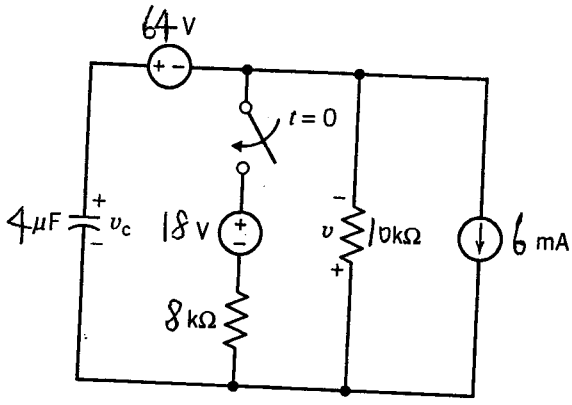

Figure 3

4. The circuit shown in Figure 4 is at steady state before the switch closes at $t=0$. The switch remains closed for 2 sec and then opens. Determine the inductor current. (10%)

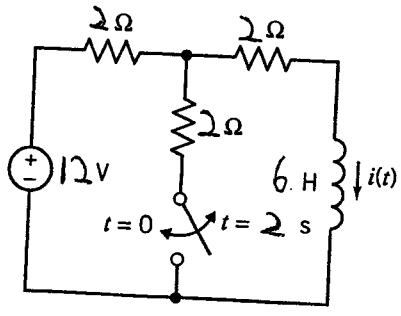

Figure 4 100

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5. The circuit shown in Fig. 1 is excited by two sources, where $v_s(t) = 10\cos(2t)$ and $i_s(t) = 5\cos(t + 45^\circ)$.
   (a) Calculate $v_R(t)$, the voltage across the 1-Ω resistor. (5 %)
   (b) Find the average power dissipated in the 1-Ω resistor. (5 %)
   (c) Find the average power supplied by the 1-H inductor. (5 %)

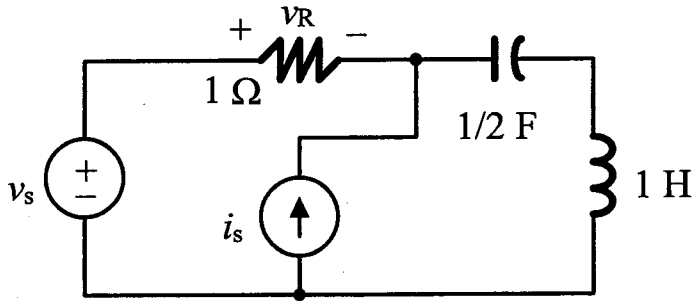

Fig. 5

6. For the rms phasor circuit shown in Fig. 2, Z_L is the load impedance.
   (a) Convert all but the load impedance to its Thevenin equivalent circuit. (4 %)
   (b) For the maximum power transfer, determine Z_L. (2 %)
   (c) Continued from (b), calculate the maximum power drawn by Z_L. (4 %)

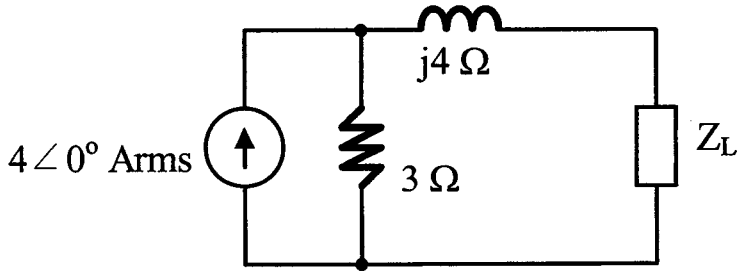

Fig. 6

7. For the phasor circuit shown in Fig. 3, $Z_L = R_L + jX_L$ is the load impedance, and $Z_C = jX_C$ is the compensating impedance for power factor correction. If the desired total power factor is to be 1, please prove that $X_C = \dfrac{R_L^2 + X_L^2}{-X_L}$. (10 %)

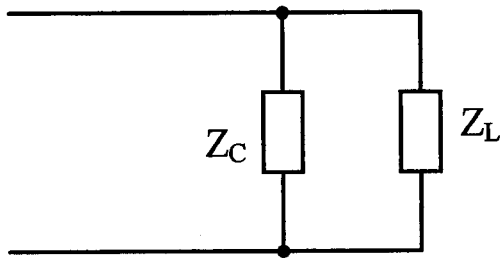

Fig. 7

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8. For the circuit shown in Fig. 4, $v_s(t) = 12[1 + u(t)]$ V, where u(t) is the unit step function. Assuming that the steady-state has been reached long before t = 0,
   (a) Calculate $i_L(0^-)$ and $v_C(0^-)$. (5 %)
   (b) Find $v_C(t)$ for t > 0. (10 %)

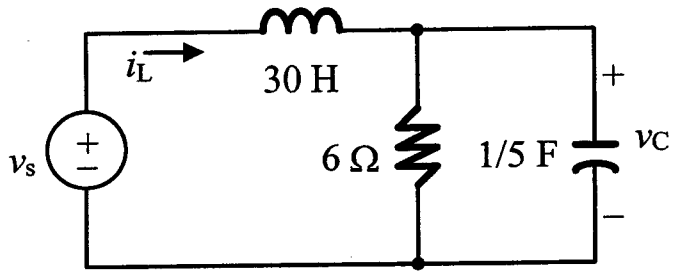

Fig. 8

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