113 EE01

國立臺北科技大學 113 學年度碩士班招生考試

系所組別：2110 電機工程系碩士班甲組

第一節　電路學　試題

注意事項：

1. 本試題共 10 題，其中　8 題每題　10 分，1 題 8 分，1 題 12 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. In Figure 1, please find the maximum power transfer to R_L and what percentage of the total power generated by these two sources is delivered to R_L ? (10%)

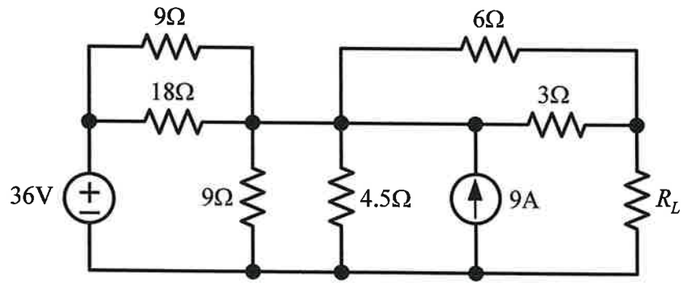

Figure 1.

2. In Figure 2, a 10V voltage source and a 5A current source are imposed on the circuit.
(a) Please find the value of v_o based on the superposition principle.
(b) If 10V is changed to 20V, and 5A is changed to 15A, then find the value of v_o. (5%, 5%)

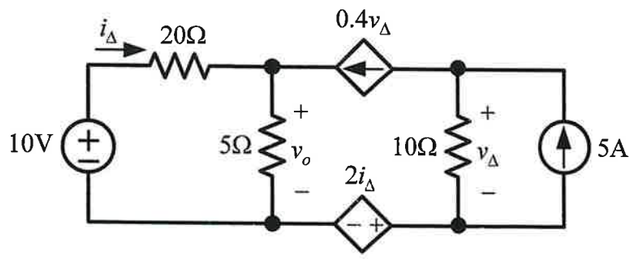

Figure 2.

3. In Figure 3, please find the current flowing through the 20H inductor, namely, $i_3(t)$. (10%)

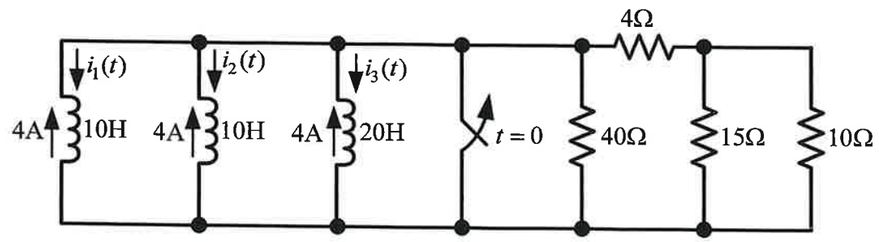

Figure 3.

4. In Figure 4, please find the value of $v_o(t)$ based on the phasor method. (10%)

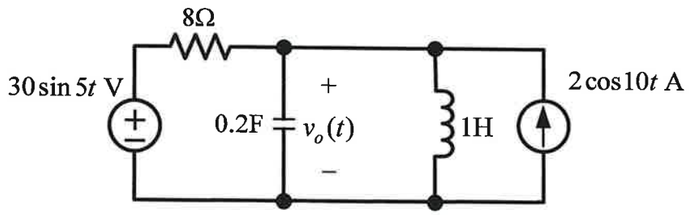

Figure 4.

5. If the impedance parameters, namely, z parameters, is expressed by $(Z)=\begin{pmatrix}10\Omega & 7.5\Omega \\ 7.5\Omega & 9.375\Omega\end{pmatrix}$, then two identical circuits are connected in parallel as shown in Figure 5. Please find the value of I_L. (10%)

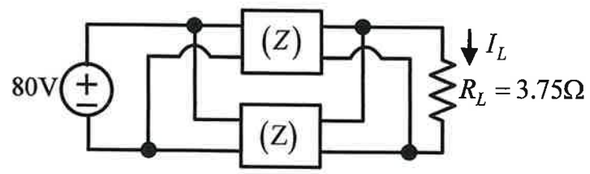

Figure 5.

6. In Figure 6, please find the expression of $v(t)$ with I=0.1A for $t \geq 0$ (10%)

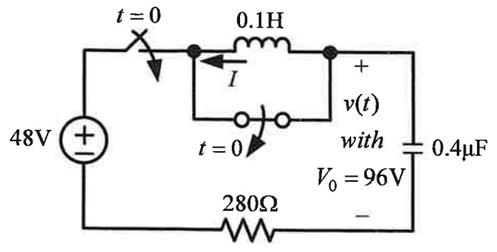

Figure 6.

注意：背面尚有試題

7. In Figure 7, (a) please find the (1) transient, (2) steady-state, (3) natural and (4) forced responses of $v(t)$, and (b) please find the (5) transient, (6) steady-state, (7) natural and (8) forced responses of $i(t)$. (1%*8)

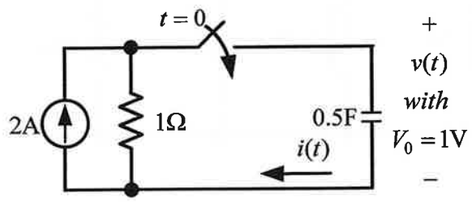

Figure 7.

8. In Figure 8, the ideal transformer is with the primary-side turns N_p versus the secondary-side turns N_s being $N_p : N_s = 5:4$. The voltages across the primary and secondary sides are expressed as v_p and v_s, respectively, and the current flowing through the primary and secondary sides are represented by i_p and i_s, respectively. Note that the answer must be expressed by the matrix form, namely, $\begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix}$. If not, no score.

(a) Please find b parameters for a single transformer.

(b) Please find b parameters for two identical transformers connected in cascade. (5%, 5%)

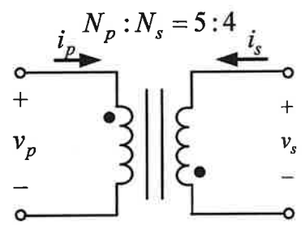

Figure 8.

9. In Figure 9, find the currents $i_1(t)$ and $i_2(t)$ at $t = \infty$, and the flux linkages $\lambda_1(t)$ and $\lambda_2(t)$ at $t = \infty$. (3%*4)

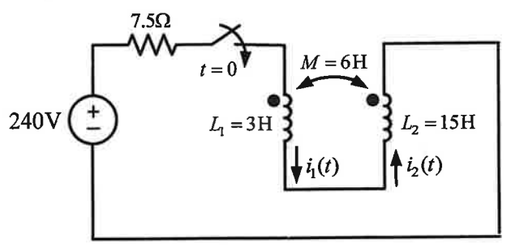

Figure 9.

10. Question and Answer (1%*10)

(1) What main feature is required for a linear system?

(2) What will happen if the KVL is not hold?

(3) What will happen if the KCL is not hold?

(4) Considering the linear circuit in the time domain, how is the output signal $y(t)$ expressed by the system signal $h(t)$ and the input signal $x(t)$?

(5) Considering the linear circuit in the Laplace domain, how is the output signal $Y(s)$ expressed by the system signal $H(s)$ and the input signal $X(s)$?

(6) What main constraint is required for the transfer function?

(7) What main constraint is required for the Fourier series?

(8) What three constraints are required when the phasor method is used?

(9) Under the step response in the Laplace domain, what two time-domain responses can be obtained by the inverse Laplace transform of the corresponding output?

(10) What is the physical meaning of the root-mean-square (RMS) value?