112EE01

國立臺北科技大學 112 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，每題 10 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 value of V_o, where B_1 and B_2 are matrixes of backward transmission parameters, equal to $B_1 = \begin{bmatrix} 0.5 & 2\Omega \\ 1.5\text{S} & 4 \end{bmatrix}$ and $B_2 = \begin{bmatrix} 2 & 0\Omega \\ 0\text{S} & 1 \end{bmatrix}$, respectively. (10%)

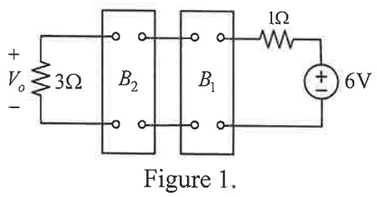


Figure 1.

2. In Figure 2, please find the current i_x using the node-voltage method. (10%)

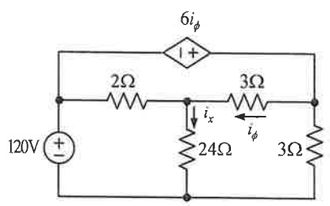


Figure 2.

3. In Figure 3, please find the current i using the supernode analysis. (10%)

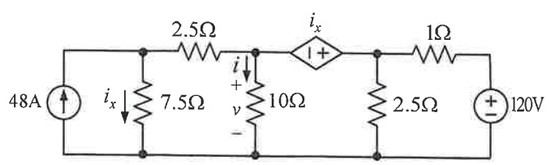


Figure 3.

4. In Figure 4, please find the power of the 16A current source using the mesh-current method. (10%)

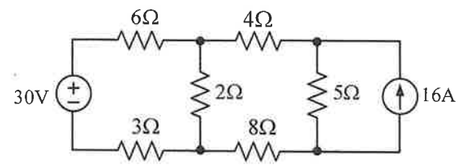


Figure 4.

5. In Figure 5, please find the power dissipated in 1Ω using the supermesh analysis. (10%)

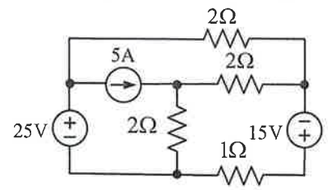


Figure 5.

6. In Figure 6, at t=0.5s, please find v_1, v_2 and the energy stored in the transformer, called w, where the values of the primary self-inductance L_1, the secondary self-inductance L_2, and the coupling coefficient k are 9H, 4H, and 0.5, respectively. (3%, 3%, 4%)

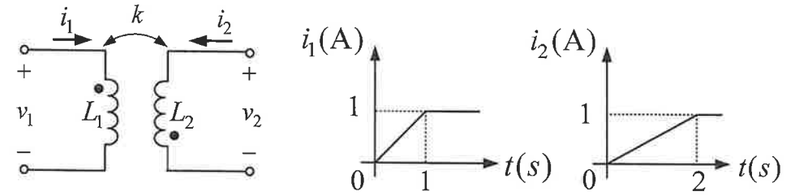
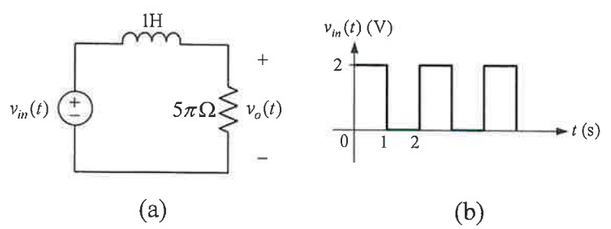


Figure 6.

7. Figure 7(a) shows a low-pass filter circuit, where $v_{in}(t)$ is shown in Figure 7(b). Accordingly, in the steady state, how about the voltage expression for the fifth harmonic (n=5) of $v_{in}(t)$ after this circuit, namely, $v_{o-5}(t)$? (10%)



(a)　　(b)

Figure 7.

注意：背面尚有試題

8. In Figure 8, an element has the voltage and current defined. If
$v(t) = 1+2\sin(\omega t + 30^\circ) + 3\cos(2\omega t + 60^\circ) + 4\cos(3\omega t - 60^\circ)$ V and
$i(t) = 4+3\cos(\omega t + 60^\circ) + 2\cos(2\omega t - 30^\circ) + \cos(4\omega t + 30^\circ)$ A, then find the rms values of $v(t)$ and $i(t)$, namely, V_{rms} and I_{rms}, and the real power, namely, P. (3%, 3%, 4%)

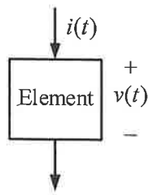


Figure 8.

9. In Figure 9, (a) find the Thevenin equivalent looking from the terminals a and b; (b) based on (a), find the maximum power transfer under the condition that k is a coupling coefficient of 0.8 and the load Z_L is purely resistive. (5%, 5%)

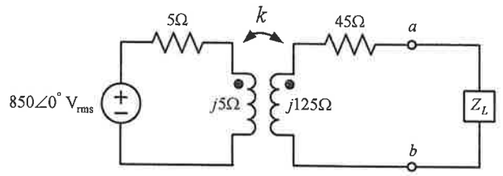


Figure 9.

10. In Figure 10, if $v(t)=20\cos(20t+30^\circ)$ V and $i(t) = -5\sin(20t - 30^\circ)$ A, then calculate out the real power P and the imaginary power Q. (5%, 5%)

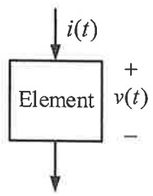


Figure 10.