112EE02

國立臺北科技大學 112 學年度碩士班招生考試

系所組別：2120 電機工程系碩士班乙組

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 voltage v_o using the node-voltage method. (10%)

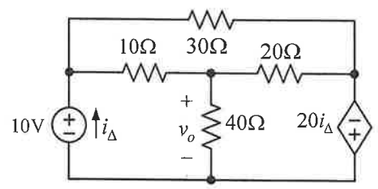

Figure 1.

2. In Figure 2, please find the current i using the supernode analysis. (10%)

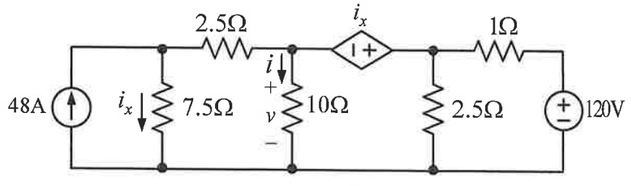

Figure 2.

3. In Figure 3, please find the power dissipated in 2Ω using the mesh-current method. (10%)

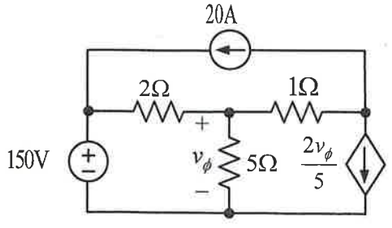

Figure 3.

4. In Figure 4, please find the power dissipated in 1Ω using the supermesh analysis. (10%)

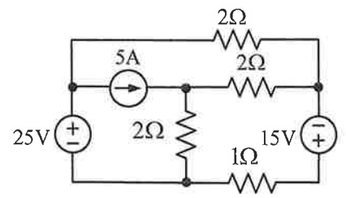

Figure 4.

5. In Figure 5, please find the value of I_o, where Z_1 and Z_2 are matrixes of impedance parameters, equal to $Z_1 = \begin{bmatrix} 2\Omega & 1\Omega \\ 1\Omega & 1\Omega \end{bmatrix}$ and $Z_2 = \begin{bmatrix} 1\Omega & 1\Omega \\ 1\Omega & 2\Omega \end{bmatrix}$, respectively. (10%)

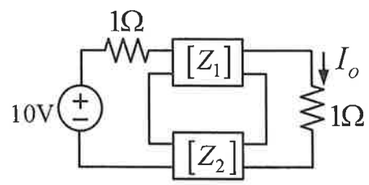

Figure 5.

6. In Figure 6, at t=0.5s, please find the values of 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%)

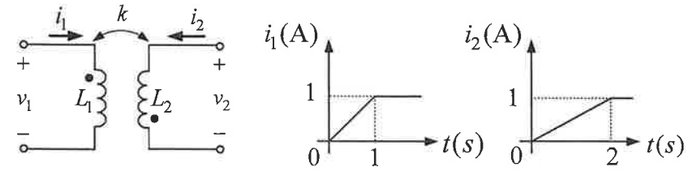

Figure 6.

7. In Figure 7, (a) plot the Thevenin equivalent circuit 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%)

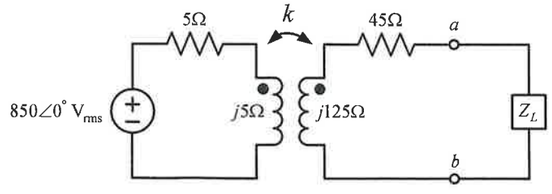

Figure 7.

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%)

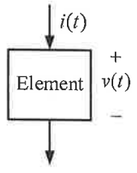

Figure 8.

9. In Figure 9, (a) find the complex power delivered from the voltage source; (b) find the value of the power factor at the sending end of the line. (5%, 5%)

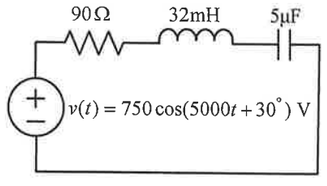

Figure 9.

10. Figure 10 shows the a-phase circuit from the balanced three-phase circuit. The power factor looking from the terminals a and n is pf_2, and the power factor looking from the terminals A and N is pf_1. (a) if pf_1=0.9, then what is the value of an additional capacitor which is used to be connected in parallel with the load. It is noted that the line radian frequency ω is 377rad/s and the line voltage is $15\sqrt{3}\text{kV}_{rms}$; (b) based on (a), what is the value of pf_2. (5%, 5%)

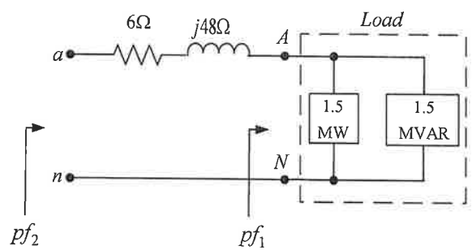

Figure 10.