

# 國立臺北科技大學 102 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

第一頁 共二頁

### 注意事項：

1. 本試題共 10 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
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. Two identical amplifiers are connected in cascade, as shown in Fig. 1. Each amplifier is described in terms of its  $a$  parameters. The value are  $a_{11} = 5 \times 10^{-4}$ ,  $a_{12} = -10\Omega$ ,  $a_{21} = -10^{-6}\text{S}$ , and  $a_{22} = -10^{-2}$ . Find  $V_o$ . (10%)

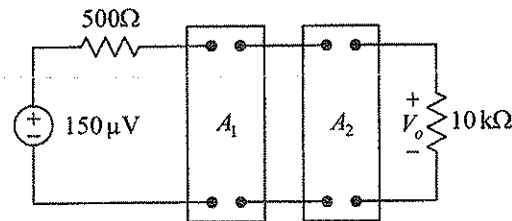


Fig. 1.

2. (a) Find  $v_o$  contributed from the 10V voltage source in Fig. 2. (5%)

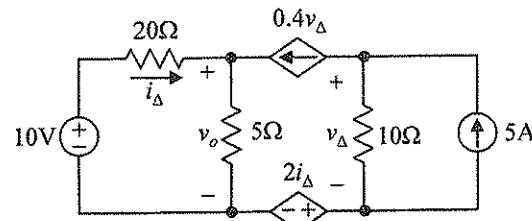


Fig. 2.

- (b) Find the  $h$  parameters for the circuit in Fig. 3, where  $[h] = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix}$ . (5%)

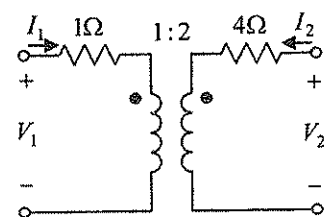


Fig. 3.

3. Find the convolution of the pair of signals in Fig. 4, i.e.,  $y(t) = x(t) * h(t)$ . (10%)

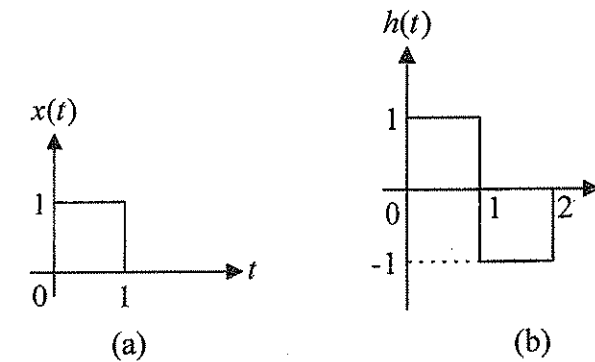


Fig. 4.

4. A system is formed by cascading two systems as shown in Fig. 5. Please find  $v_o(t)$  in the steady state if  $h_1(t) = h_2(t) = e^{-At}u(t)$  and  $v_i(t) = 4 \cos(4t + 135^\circ)\text{V}$ . (10%)



Fig. 5.

5. Find  $V_o$  in the circuit shown in Fig. 6. (10%)

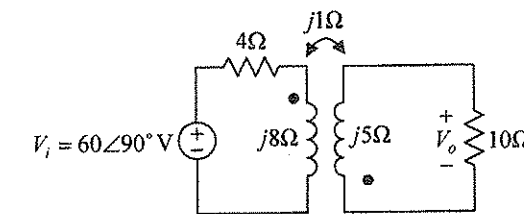


Fig. 6.

6. Assume that the two balanced loads in Fig. 7 are supplied by an 840 V<sub>rms</sub> 60Hz line. Load 1 is Y-connected with  $30 + j40\Omega$  per phase, while load 2 is a balanced three-phase motor drawing 48kW at a power factor of 0.8 lagging. Assuming the  $abc$  sequence, calculate (a) the kVAR rating of each of the three capacitors  $\Delta$ -connected in parallel with the load to raise the power factor to unity, and (b) the current drawn from the supply at unity power factor condition. (5%, 5%)

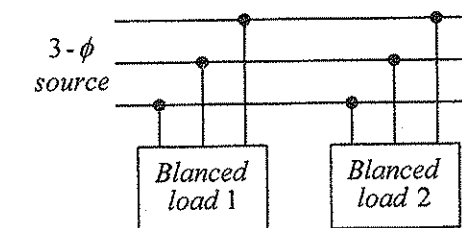


Fig. 7.

注意：背面尚有試題

7. Calculate the average power dissipated by the  $10\Omega$  resistor in the circuit shown in Fig. 8 if  $i_s(t) = 3 + 2\cos(50t - 60^\circ) + 0.5\cos(100t - 120^\circ)$  A. (10%)

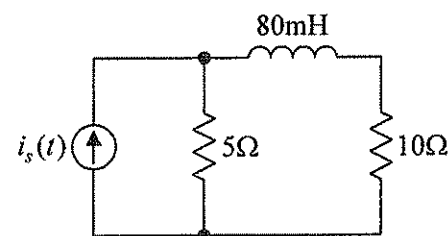


Fig. 8.

8. Find the efficiency of the circuit under the maximum power transfer, as shown in Fig. 9. (10%)

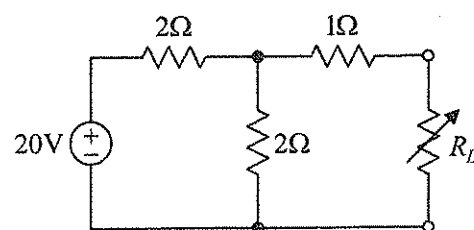


Fig. 9.

9. Find the bandwidth and quality factor of the circuit shown in Fig. 10. (5%, 5%)

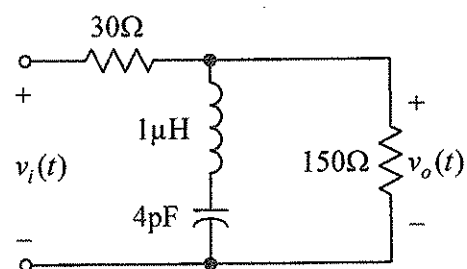


Fig. 10.

10. The variable resistor ( $R_o$ ), shown in Fig. 11, is adjusted until the power dissipated in the resistor is 250W. Find the values of  $R_o$  that satisfy this condition. (10%)

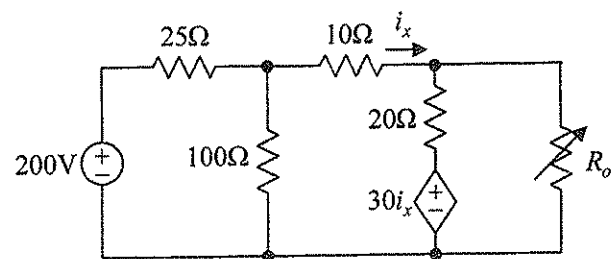


Fig. 11.