國立成功大學

115學年度碩士班招生考試試題

編　號：121

系　所：電機工程學系

科　目：電路學

日　期：0203

節　次：第 1 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. The voltage across an unknown electric device (a black box) is given by

$$v(t) = -2 + 10\cos(4t) + 8\cos(6t) + 6\cos(8t) - 5\sin(4t) - 3\sin(6t) - \sin(8t)\ \text{V}$$

Please find the period, the average value, and the effective value of $v(t)$. (25%)

2. Please solve for the voltage gain $A_v = v_o/v_i$ of the ideal operational amplifier circuit shown in Fig. 2 if $R_f = 500\ \text{k}\Omega$, $R_1 = 25\ \text{k}\Omega$, $R_2 = 10\ \text{k}\Omega$, $R_3 = 2\ \text{k}\Omega$, $R_S = 20\ \text{k}\Omega$, $R_T = 30\ \text{k}\Omega$, $R_U = 40\ \text{k}\Omega$, and $R_V = 80\ \text{k}\Omega$. (25%)

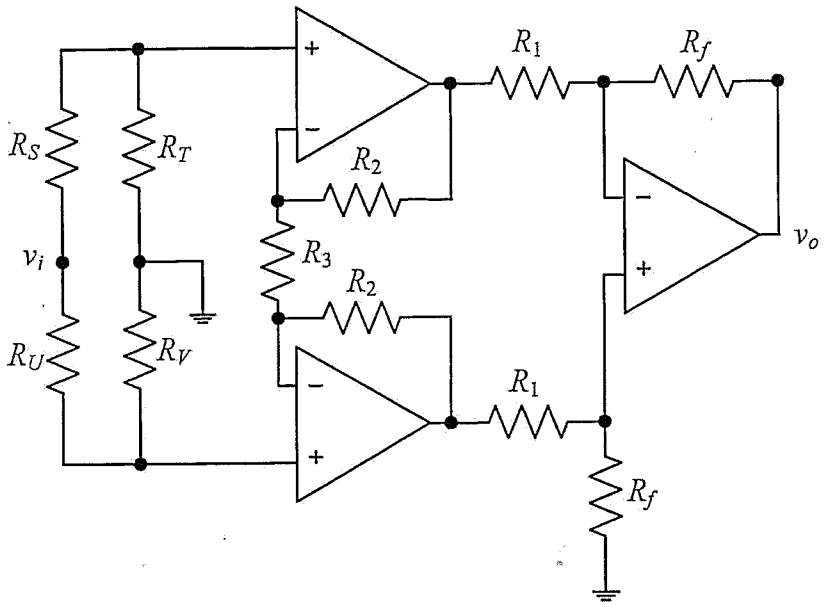

Fig. 2.

3. Please compute the **z** or open-circuit impedance parameters for the network in Fig. 3 when $R_a = 2\ \Omega$, $R_b = 8\ \Omega$, $R_c = 12\ \Omega$, and $R_d = 4\ \Omega$. (25%)
4. The switch in Fig. 4 has been open for a long time and is suddenly closed at $t = 0$ s. Please determine $v(t)$ for $t > 0$ s if $I_{s1} = 4$ A, $R_{s1} = 1\ \Omega$, $I_{s2} = 2$ A, $R_{s2} = 6\ \Omega$, $L = 1$ H, and $C = 0.04$ F. (25%)

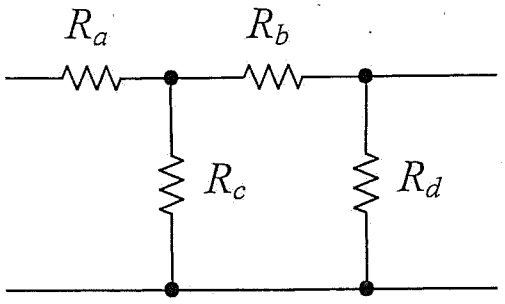

Fig. 3.

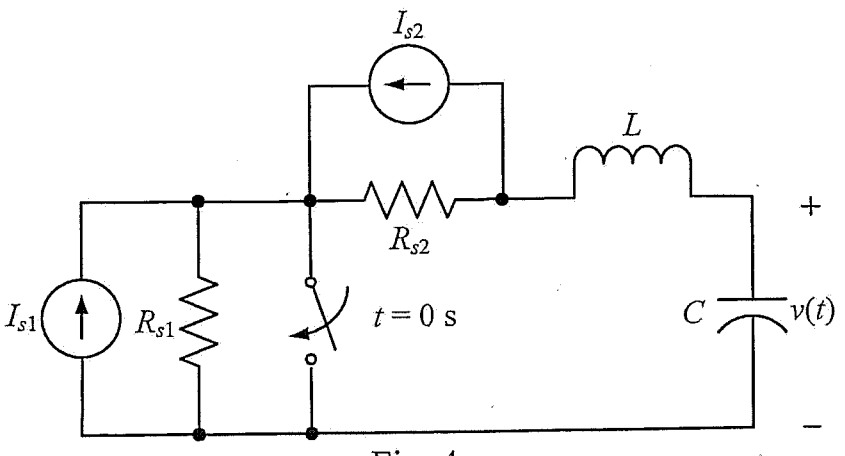

Fig. 4.