國立成功大學

114學年度碩士班招生考試試題

編　號：123

系　所：電機工程學系

科　目：電路學

日　期：0210

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. In the ideal autotransformer circuit of Fig. 1, the load impedance $\mathbf{Z}_L$ is adjusted until it absorbs the maximum average power. Assume $\mathbf{V}_s = 120\angle 0°$ Vrms, $\mathbf{Z}_s = 75 + j125\ \Omega$, $N_1 = 600$ turns, and $N_2 = 200$ turns. Find $\mathbf{Z}_L$ and the maximum average power delivered to it. (25%)

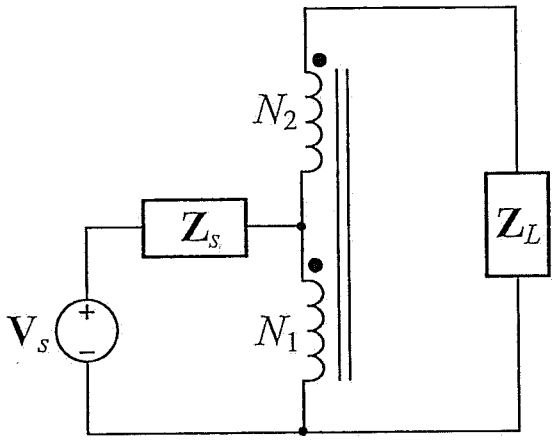

Fig. 1.

2. A special-design winding is modeled as a series combination of an inductance L_b and a resistance R_b, as shown in Fig. 2. Since an AC voltmeter measures only the effective value of a sinusoid, the following measurements are taken at 60 Hz when the circuit operates under a steady-state condition: $|\mathbf{V}_s| = 145$ V, $|\mathbf{V}_a| = 50$ V, and $|\mathbf{V}_b| = 110$ V. Assume $R_a = 80\ \Omega$. Use these measurements to determine the values of L_b and R_b. (25%)

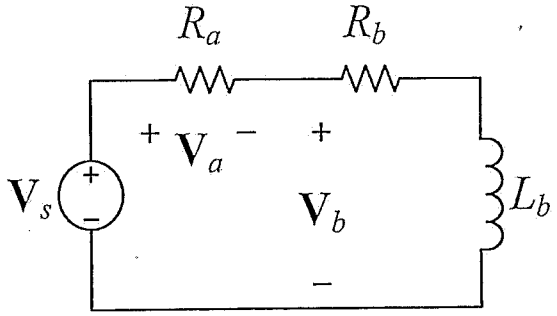

Fig. 2.

3. A mechanical system is modeled by a series *RLC* circuit. It is desired to produce an overdamped response with the time constants of 0.1 ms and 0.5 ms. If a series resistor of 120 Ω is used, find the values of L and C. (25%)

4. A certain band-limited periodic current has only three frequencies in its Fourier series representation: DC, 50 Hz, and 100 Hz. The current may be represented as $i(t) = 4 + 6\sin 100(\pi t) + 8\cos(100\pi t) - 3\sin(200\pi t) - 4\cos(200\pi t)$ A. (1) Express the current $i(t)$ in amplitude-phase form. (2) If the current $i(t)$ flows through a resistor of 200 Ω, determine the average power dissipated on it. (25%)