



國立臺灣海洋大學一〇〇學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目：電力工程（含電機機械及電路學）

系所名稱：電機工程學系碩士班電力組

※可使用計算器

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

1. Consider the circuit shown in Fig. 1 in which $v_i(t)$ and $v_o(t)$ are the input and output, respectively. Let $R_1 = 1\Omega$, $R_2 = 2\Omega$, $C = 5\text{ F}$. Find the impulse response and the step response of the circuit. (10%)
2. Consider the circuit shown in Fig. 2 where $R_1 = 96\Omega$, $R_2 = 32\Omega$, $R_3 = 120\Omega$ and $R_4 = 30\Omega$. (15%)
 - (a) If $v_s = 20\text{ V}$ and Z is a 2Ω resistor, find the current i_o .
 - (b) If $v_s = 5 + 15u(t)\text{ V}$, where $u(t)$ denotes the unit step, and Z is a 16.67 mF capacitor, find the current i_o .
3. Find v_o/v_s for each of the circuits shown in Figs. 3(a) and 3(b). Assume all the operational amplifiers are ideal. (10%)
4. A single-phase motor is in parallel with two impedances ($8 - j16\Omega$ and $0.8 + j5.6\Omega$), and they are supplied from a single-phase 60-Hz source with 200 V rms. The motor draws 5 kVA at 0.8 power factor lagging. (15%)
 - (a) Find the complex power for each of the motor and the two impedances.
 - (b) Find the total power from the source, the supply current from the source, and the overall power factor.
 - (c) A capacitor is to be connected in parallel with the three loads. Find the reactive power and the capacitance to improve the overall power factor to unity and calculate the new line current.
5. Explain the basic principles with which magnetic fields are used in the energy conversion of transformer, generator, and motor. (15%)
6. Consider the power transformer. (15%)
 - (a) Explain the assumptions for the ideal power transformer by referring to its equivalent circuit.
 - (b) Describe the procedure of the tests used for determining the parameters of the equivalent circuit in (a).
7. Consider the synchronous generator. (20%)
 - (a) Describe the single-phase equivalent circuit for the three-phase synchronous generator, and explain the power angle and the power factor angle by plotting a phasor diagram for a synchronous generator supplying a load with lagging power factor, respectively.
 - (b) A synchronous generator delivers power to an electric distribution system at 11.4 kV. The generator impedance is 6.5Ω per phase with negligible resistance. The magnitude of the generator emf is 20% higher than the machine terminal voltage. When the machine delivers a total power of 36 MW to the system, find the power angle at which the machine is operating.

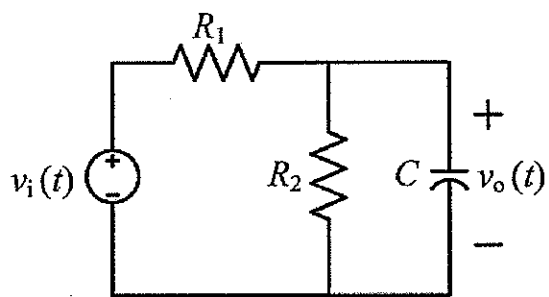


Fig. 1

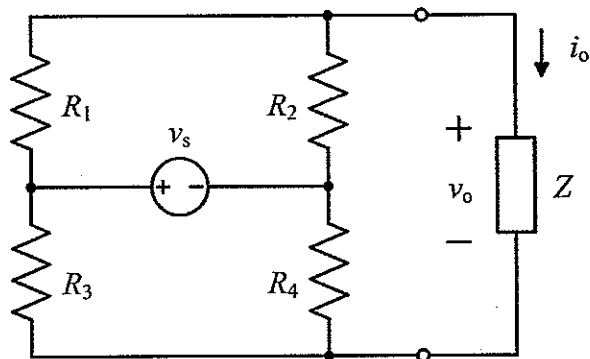


Fig. 2

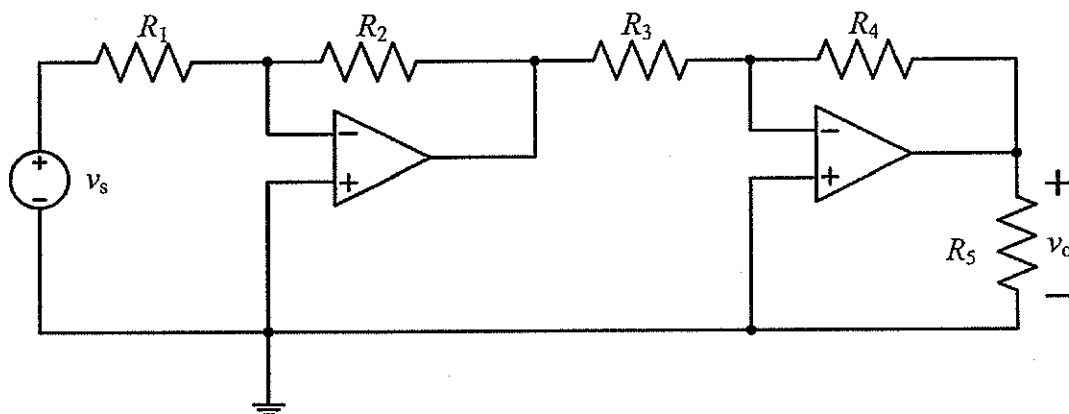


Fig. 3(a)

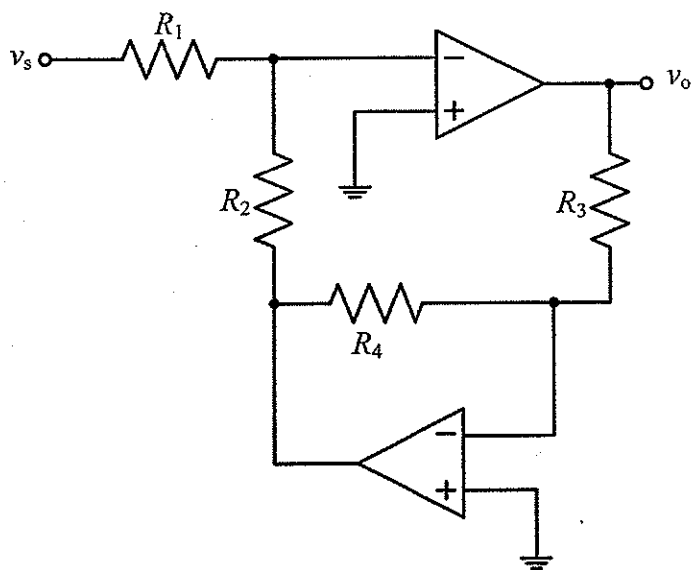


Fig. 3(b)