大同大學 103 學年度研究所碩士班入學考試試題

考試科目：電路學　　所別：電機工程研究所　　第1頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

1. Find $\mathbf{V_1}$, $\mathbf{I_1}$, $\mathbf{I_o}$, and $\mathbf{V_x}$ for Fig. 1. **(25%)**

2. Find $\mathbf{V_1}$, $\mathbf{I_x}$, $\mathbf{I_o}$, and $\mathbf{V_2}$ for Fig. 2. **(25%)**

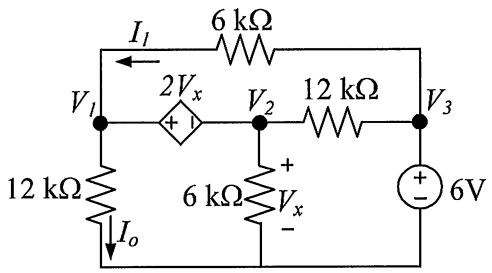

Fig. 1

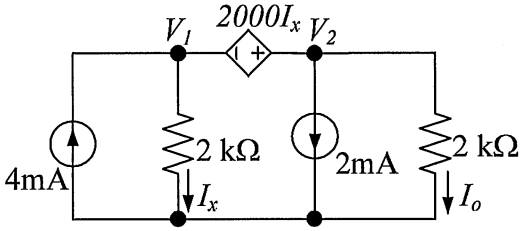

Fig. 2

3. Find the resonant frequency ω_r and the input impedance at ω_r for the circuit of Fig. 3. **(10%)**

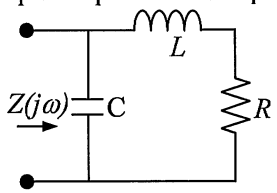

Fig. 3

4. The Laplace transform of a capacitor voltage is given by $V_C(s) = \frac{2}{s} - \frac{1}{5s+2}$

   Find the initial capacitor voltage $v_c(0^+)$. **(10%)**

5. An industrial plant has a 100-kVA, 230-V generator that supplies power to one large motor and several identical smaller motors. The resistance of the connecting line is assumed negligible in the approximate analysis that follows. The large motor labeled type A draws 50kW at a pf (power factor) of 0.8 lagging. Each smaller motor of type B draws 5kW at a pf of 0.7 lagging. The configuration is illustrated in Fig. 4. **(30%)**

(a) Can the generator safely supply power to one large motor and three small motors? What are the generator current (magnitude) and the power factor of the combined loads?

(b) Compute the number of small motors (besides the one large motor) that can be run simultaneously without exceeding the generator's rating.

(c) If the power factor of all motors, large or small, is corrected to 0.9 lagging by connecting appropriate parallel capacitors, how many small motors, besides the one large motor, can be run simultaneously without exceeding the generator's rating?

(d) Compute the capacitances required in part (c) for the large and the small motors.

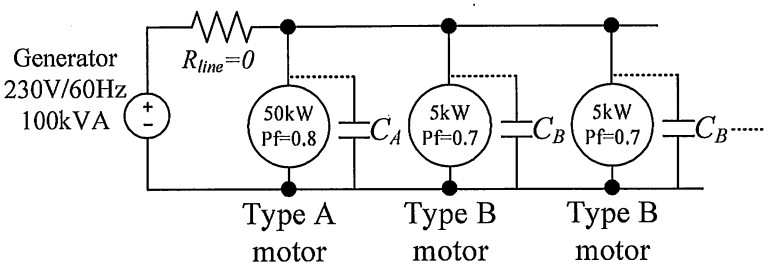

Fig. 4