大同大學 九十三 學年度研究所碩士班入學考試試題

考試科目：電力系統　　所別：電機工程研究所　　

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； 不可以使用計算器。

1. A three-phase motor is used to drive a pump. It is observed that the motor speed decreased from 998 rpm at no load to 950 rpm at full load. (15%)
   (a) Is this a synchronous or induction motor?
   (b) Estimate the frequency of the applied voltage in Hz.
   (c) How many poles does the motor have?

2. Explain the following items. (10%)
   (a) Compensation-winding of DC machine.
   (b) Slip and slip region of the induction machine (motor and generator).

3. A three-phase line has an impedance of $0.4 + j2.7\ \Omega$ per phase. The line supplies two loads connected in parallel. The load 1 is 560.1 kVA at 0.707 power factor lagging. The load 2 is 132 kW at unity power factor. The line-to-line voltage at the load end is 3810.5 V. Determine
   (a) the magnitude of the line voltage at the source end of the line,
   (b) real and reactive power supplied at the sending end of the line. (10%)

4. A three-phase short circuit occurs at the generator bus (bus 1) for the system shown in Fig. 4. Neglecting prefault currents and assuming that the generator is operating at its rated voltage. (25%)
   (a) Draw the equivalent reactance diagram with corresponding per-unit values are marked. Choose the base values of 25 MVA and 13.8 kV on the generator side.
   (b) Calculate the subtransient fault current of per-unit value.

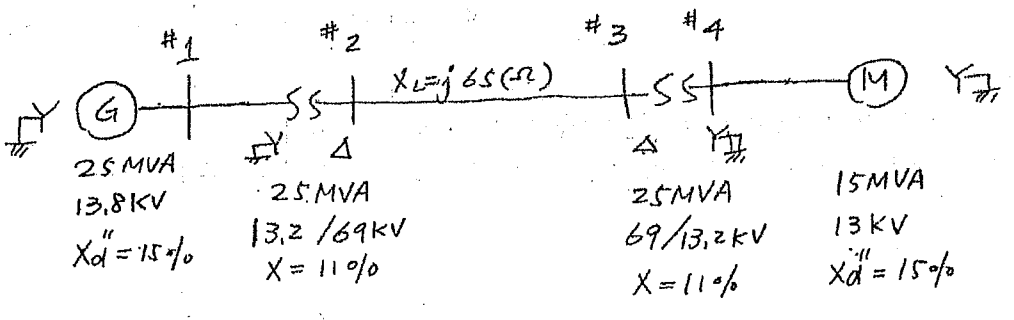

Fig. 4

5. An industrial dryer operates at 600 Volt and requires 50 A. The unit consists of a fan in parallel with a heater. The fan draws 20 kW and has a lagging power factor of 0.8. Use a power triangle to find the resistance of the heater, assuming that it has unity power factor. (15%)

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6. In Fig. 6, load 1 has a balanced delta (Δ) configuration, while load 2 has a balanced wye (Y) configuration, with the frequency of 60 Hz, $V_{ab} = 380$ V(rms), $Z_l = 3 + j\,\Omega$, $Z_{\Delta 1} = 24 + j12\,\Omega$, and $Z_{Y2} = 5 + j10\,\Omega$. (15%)

   (a) Find the average power drawn by each load.

   (b) Find the power factor seen by the generator.

   (c) Find the capacitance C_Δ added in parallel to the load, increasing the power factor to 0.95 lagging.

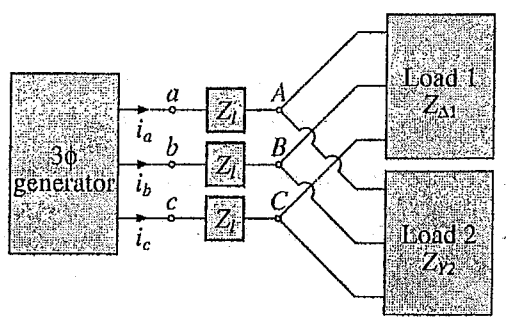

Fig. 6

7. Consider a three-wire composite system with two single-phase loads and two wattmeters, as shown in Fig. 7. The given values are $V_{ab} = 380\angle 0°$ V(rms) and $Z_\Delta = 8\angle 60°\ \Omega$ for the 3ϕ load (Δ configuration). (10%)

   (a) Find I_a, I_b, and I_c.

   (b) Find the resultant readings of $P_1 + P_2$.

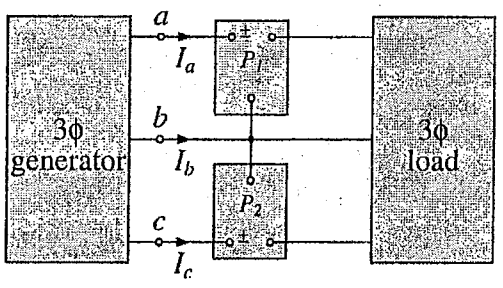

Fig. 7