大同大學 九十二 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　　第 全 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. A single-phase two-winding transformer rated 3kVA, 220/110V, 60Hz, with 0.10per-unit leakage reactance, and has an efficiency of 0.96 when operated at rated load, 0.8 power factor lagging. This transformer is utilized as a 330/110V) step-down transformer in a distribution system. (a) Find the permissible KVA rating of this(transformen (b) Find the equivalent leakage reactance in per-unit value. (c) Determine the efficiency if it is operated at full load and 0.8 power factor lagging. 12%

2. (a) Why is it needed to calculate the short circuit current in power system design? (b) Why is the single phase short circuit current larger than the three phase short circuit current in some cases? (c) How to depress the single phase short circuit to be less than that of three phase short circuit? 12%

3. If you are assigned to write a computer program for generation economic dispatch and the equal incremental cost method is used, please draw a flow chart to show how the program works. (System losses may be ignored.) 12%

4. A single-phase transformer has the following nameplate data: 2300/220 V, 60 Hz, 5 kVA. A short-circuit test (low-voltage winding short-circuited) requires 66 V on the high-voltage winding to produce rated full-load current; 90 W is measured on the input. Determine the transformer's percent regulation for a load of rated current and a power factor of 0.80, lagging. 16%

5. A three-phase, 240-V, wye-connected, 15-hp, six-pole, 60-Hz, wound-rotor induction motor has the following equivalent-circuit constants referred to the stator: $r_1 = 0.30$, $r_2 = 0.15$, $x_1 = 0.45$, $x_2 = 0.25$, and $x_\phi = 15.5\ \Omega$ per phase. At all loads the core losses, friction, and windage are 500 W. Compare the inrush (starting) current with the load current at 3 percent slip, assuming that the rotor windings are short-circuited. 16%

6. A dc series motor with a design constant $K_a = 40$ and flux per pole of 46.15 mWb operates at 200 V while taking a current of 325 A. The total series-field and armature-circuit resistance are 25 mΩ and 50 mΩ, respectively. The core loss is 220 W; friction and windage loss is 40 W. Determine (a) electromagnetic torque developed, (b) motor speed, (c) mechanical power output, and (d) motor efficiency. 16%

7. A three-phase, wye-connected, 2,300-V, 60-Hz round-rotor synchronous motor has a synchronous reactance of 2 Ω per phase and negligible armature resistance. 16%

   a. If the motor takes a line current of 350 A operating at 0.8 power factor leading, calculate the excitation voltage and the power angle.

   b. If the motor is operating on load with a power angle of −20°, and the excitation is adjusted so that the excitation voltage is equal in magnitude to the terminal voltage, determine the armature current and the power factor of the motor.