國立中山大學 101 學年度碩士暨碩士專班招生考試試題

科目：電力工程【電機系碩士班丁組】

題號：4072

1. Discuss four basic losses such as core loss that occur in AC machine and draw the power flow diagrams from P_{in} to P_{out} for a three-phase AC generator and a three-phase AC motor, respectively. (20%)

2. Describe the solution procedure of a power flow problem solved by a Gauss-Seidel technique. (including the procedure for swing bus, PV bus and PQ bus) (15%)

3. A 200 hp, 440 V, 0.8-PF-leading, Δ-connected synchronous motor has an armature resistance of $0.22\,\Omega$ and a synchronous reactance of $3.0\,\Omega$. Its efficiency at full load is 89%.
   (a) What is the input power, line current and phase current to the motor at rated conditions? (10%)
   (b) What is the internal generated voltage of the motor at rated conditions? (10%)

4. The fuel cost function in \$/h for three thermal plants are given by
   $C_1(P_1) = 625 + 7.3P_1 + 0.0025P_1^2$
   $C_2(P_2) = 345 + 7.2P_2 + 0.004P_2^2$
   $C_3(P_3) = 527 + 6.74P_3 + 0.003P_3^2$
   where P_1, P_2 and P_3 are in MW. Assume that all three units operate economically to meet the total plant load of 450MW, find the incremental cost and the required output of each plant. (20%)

5. Fig. 1 shows a three-bus power system, calculate
   (a) Admittance matrix ($\boldsymbol{Y}_{bus}$). (10%)
   (b) Impedance matrix ($\boldsymbol{Z}_{bus}$). (10%)
   (c) If a balanced short-circuit fault occurred on bus 2, find the short-circuit current (The voltage at bus 2 is 1.0 p.u.). (5%)

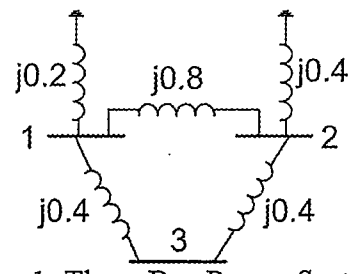

Fig. 1: Three-Bus Power System