1. (10%)

   (a) Define the meaning of "slip" of the induction machine.

   (b) Describe the region of "slip" when this machine is operating as a motor, as a generator, and as in braking state.

2. Two synchronous generators G_1 and G_2 are tied together to supply power to a definite system load $S_L = P_L + jQ_L$. The power delivered from G_1 is $S_1 = P_1 + jQ_1$, and G_2 is $S_2 = P_2 + jQ_2$. Describe the method to adjust the load sharing between G_1 and G_2 include P_1 and P_2, Q_1 and Q_2. (20%)

3. An industrial plant has a generator to supply part of its loads. The generator is connected to the Taiwan Power Company (TPC) through a transformer with reactance of 0.05 p.u. as shown in Fig. 3. Assume the voltage at the interconnecting point (V_1) is 1.0 p.u., and the plant has to buy the power of 5.0 p.u., 1.0 power factor from the TPC to satisfy its load of $20 + j15$ p.u. (20%)

   (a) Determine the terminal voltage setting of the generator (V_2).

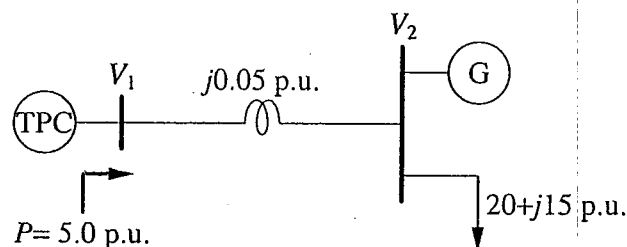   (b) Find the real and reative power output of the generator.

Fig. 3

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) required 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. (20%)

5. A balanced three-phase distribution system has 240 V between phases, a 20-Ω resistive load is connected from phase b to phase c; phase a is open. Using symmetrical components, calculate the power delivered to the resistor. Actually, the resistor represents an unbalanced load on a balanced three-phase system. See Fig. 5. (15%)
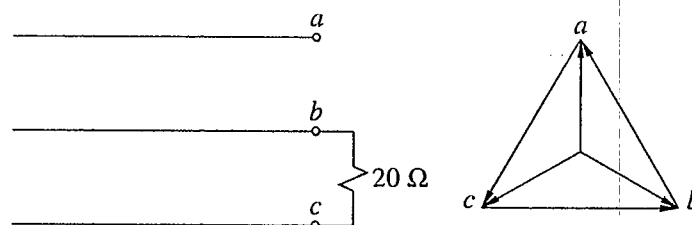

Fig. 5

6. An inductive motor draws 15 kW and 65 A from a 500 V, 50 Hz source. The total current drops to 50 A when a capacitor is connected in parallel with the motor. Find the capacitance values of C. (15%)