國立中山大學 104 學年度碩士暨碩士專班招生考試試題

科目名稱：電力工程【電機系碩士班丁組】　　題號：431010

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）(問答申論題)　　

1. The impedance matrix (Z_{BUS}) for Fig.1 can be expressed as eq. (1). (25%)
   (a) Calculate the Z matrix after the line between Bus 2 and Bus 4 is removed; (15%)
   (b) Assuming the bus voltages before fault are all 1.0p.u. Calculate the short circuit current when a three-phase short-circuit fault occurred at Bus 3 for (a) and bus voltages after this fault. (10%)

$$\mathbf{Z}_{BUS} = j\begin{bmatrix} 0.71160 & 0.60922 & 0.53340 & 0.58049 \\ 0.60922 & 0.73190 & 0.64008 & 0.69659 \\ 0.53340 & 0.64008 & 0.71660 & 0.66915 \\ 0.58049 & 0.69659 & 0.66915 & 0.76310 \end{bmatrix} \quad (1)$$

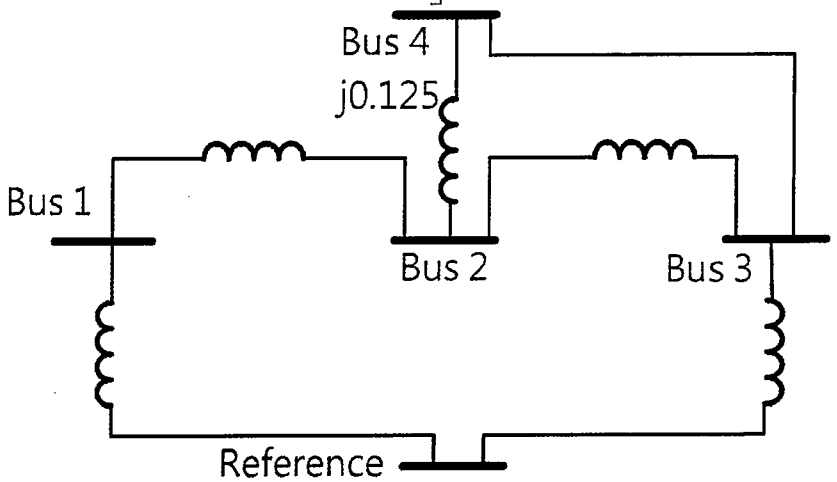

Fig. 1

2. A Y-connected load bank with a three-phase rating of 1000 kVA and 1150 V consists of three identical resistors of 1.3225 ohms. The load bank has the following applied voltages: $V_{ab} = 920\angle 82.8°$, $V_{bc} = 1380\angle -41.4°$, and $V_{ca} = 1150\angle 180°$ V. Determine (15%)
   (a) the zero-, positive- and negative-sequence line-to-neutral voltages V_{an0}, V_{an1}, and V_{an2}; (5%)
   (b) the zero-, positive- and negative-sequence line-to-line voltages V_{ab0}, V_{ab1}, and V_{ab2}; (5%)
   (c) the zero-, positive- and negative-sequence line currents I_{a0}, I_{a1},and I_{a2}. (5%)
   (All answers should be in p.u.)
3. Calculate the line flows and power flows from Bus *i* to Bus *j* and Bus *j* to Bus *i* for Fig. 2 and the line loss for this line (all values in Fig. 2 are in p.u.). (20%)

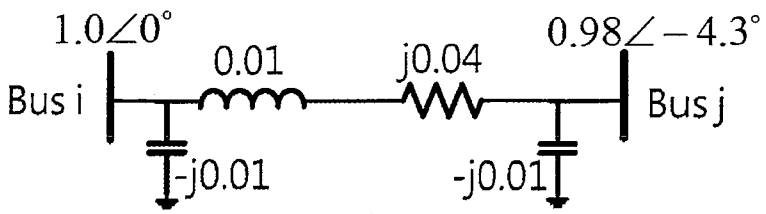

Fig. 2

4. The inertia constant (H) of a three-phase 60-Hz generator is 1.5 p.u.-s. The electrical power delivery by the generator (P_e) versus its power angle (δ) can be expressed as eq. (2). The mechanical power input to the generator (P_m) is 0.5 p.u. (25%)

$$P_e = 1.2319\sin(\delta) \quad (2)$$

   (a) Determine the swing equation and the initial operating power angle. (10%)
   (b) Calculate the critical clearing time for the generator when a three-phase bolted short-circuit at the generator terminals causes P_e=0. (15%)

國立中山大學104學年度碩士暨碩士專班招生考試試題

科目名稱：電力工程【電機系碩士班丁組】　　題號：431010

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）(問答申論題)　　

5. Draw the phasor diagrams between the voltages and current of a synchronous generator of Fig. 3 at (a) unity power factor, (b) lagging power factor and (c) leading power factor. (15%)

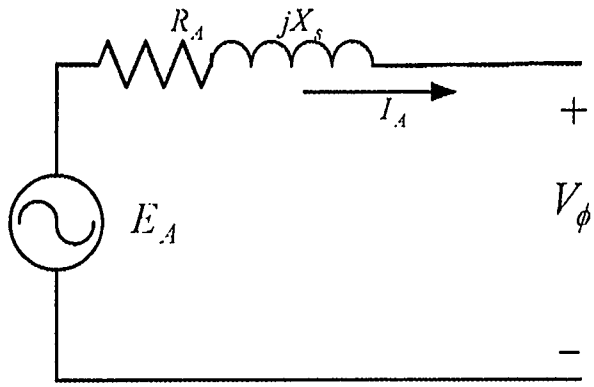

Fig. 3