

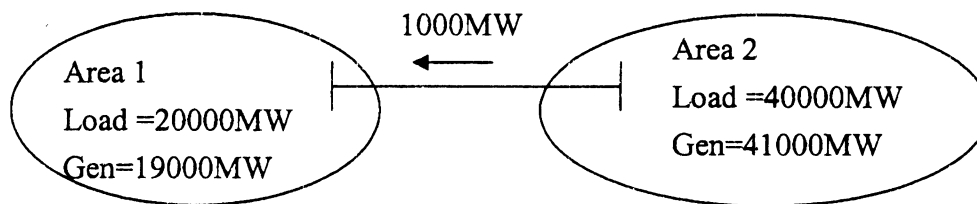
系所組別： 電機工程學系丙組

考試科目： 電力系統

考試日期： 0307，節次： 2

※ 考生請注意：本試題 可 不可 使用計算機

1. (1) (10%) Please describe the principle of the starting torque generated in a shaded-pole motor.
- (2) (10%) Why does the synchronous motor often employ damper windings in its pole-face.
2. (15%) By comparing with the two-stage AC-DC-AC voltage conversion, please list the merits of cycloconverters and explain each of them.
3. (15%) Please explain the reason why the Metal-Oxide-Semiconductor Field Effect Transistors (MOSFETs) are appropriate to operate in parallel.
4. (14%) Consider two interconnect areas as follows:



The connect load at 60 Hz is 20000MW in area 1 and 40000MW in area 2. System load varies 1 percent for every 1 percent change in frequency, i.e., $D=1.5$. The speed regulation is 5% for all generating units. Area 1 is importing 1000MW from area 2. Two areas have their own generating capacity. Area 1 is operating with a spinning reserve (backup generation) of 1000MW over the 20000 MW capacity, and Area 2 is operating with a spinning reserve of 1000MW over the 42000MW capacity.

There is an increase of load by 1000MW in area 1. No supplementary control is involved, please find the following

- I. steady-state frequency deviation in Hz after the governor response.
 - II. change of spinning reserve in MW for each area to support this load increase.
 - III. new tie-line power flow in MW from area 2 to area 1.
 - IV. change in MW load due to frequency drop at the steady state value.
5. (11%) In three phase system, consider the phasor representation of a three phase balanced current shown below

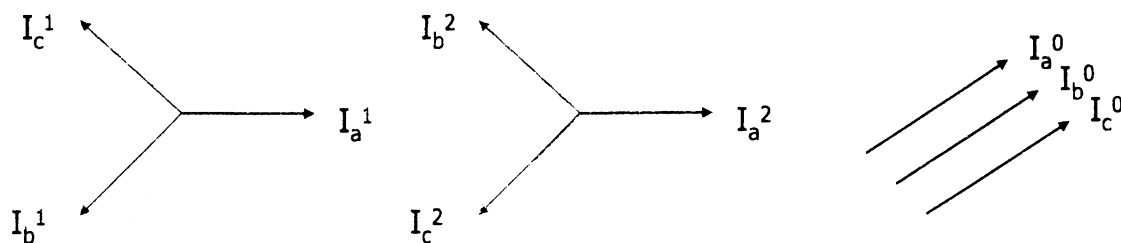
(背面仍有題目,請繼續作答)

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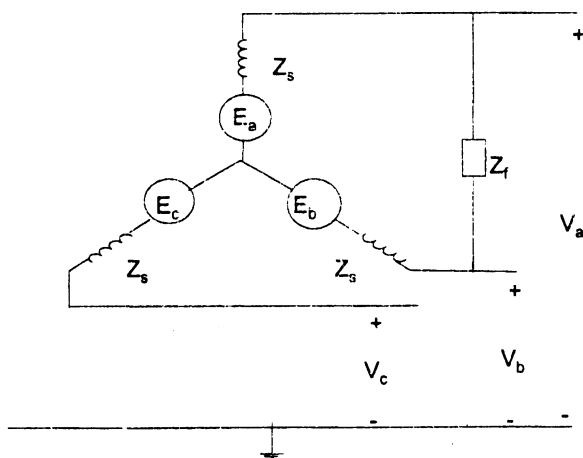
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(a) (6%) Please find the transformation matrix A such that $I^{abc} = AI_C^{012}$. (using a operator as $a=1 \angle 120^\circ$ in the A matrix representation)

(b) (5%) For the A derived from (a), please derive A^{-1} (using a operator as $a=1 \angle 120^\circ$ in the A matrix representation)

6. (25%) Continue on Question 5. A three-phase generator with a fault through an impedance Z_f between phases a and b, which is depicted in the figure below;



Determine

- I. (5%) **boundary condition** of the fault.
 - II. (10%) the **fault current** I_C^{012} in terms of E_C and symmetrical impedance Z^1 , Z^2 , and Z^0 with fault impedance Z_f . (You should make the whole derivation to obtain the full points, a correct result without derivation will obtain partial of the credit)
 - III. (10%) draw the **equivalent circuit** from the result you derived in part II.
- where sequence networks are:

