

大同大學 98 學年度研究所碩士班入學考試試題

考試科目：電力系統(含電機機械)

所別：電機工程研究所

第1頁(共2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. The series-impedance matrix of a perfectly balanced line with one ground wire is

$$Z_{abc-g} = \begin{matrix} a & j3.5 & j2.5 & j2.5 & j1 \\ b & j2.5 & j3.5 & j2.5 & j1 \\ c & j2.5 & j2.5 & j3.5 & j1 \\ w & j1 & j1 & j1 & j2 \end{matrix}$$

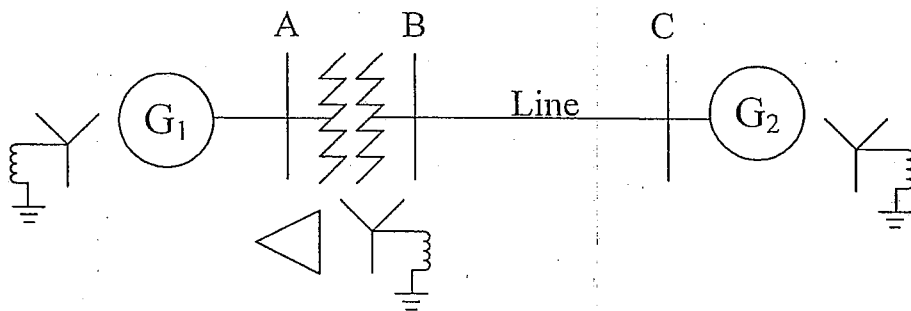
(a) Find Z_0, Z_1 for this line. (10%)

(b) If $I_a = 10\angle 0^\circ$, $I_b = 11\angle -90^\circ$ and $I_c = 8\angle 150^\circ$; find the zero-, positive- and negative- sequence voltage line drops. (10%)

2. Draw the zero-sequence equivalent circuit for the following transformer connections. (10%)

P-Side	Q-Side	Zero-Sequence Equivalent Circuit

3. Consider the following system for problem 3. (20%)



P.U. Reactance Data (all resistance= 0.0)

	Positive Sequence	Negative Sequence	Zero Sequence	Neutral-to-Grd.
Gen. 1	j0.1	j0.1	j0.04	j0.02
Gen. 2	j0.1	j0.1	j0.04	j0.02
Transf.	j0.1	j0.1	j0.10	j0.05
Line	j0.2	j0.2	j0.50	-

Find the Z-Bus impedance matrix for the positive and zero-sequence networks (negative same as positive.)

〈背面繼續〉

4. A single-phase transformer is rated 100kVA, 7.97kV-240V. The open-circuit and short-circuit tests were conducted with the following results:
 $V_{OC}=240V$, $I_{OC}=12A$, $P_{OC}=1200W$
 $V_{SC}=500V$, $I_{SC}=12.5A$, $P_{SC}=1500W$
- (a) Find the core-loss resistance and the magnetizing reactance of the transformer with the values referred to the high-voltage side. (10%)
 - (b) Find the impedance of the windings of the transformer referred to the high-voltage side. (10%)
 - (c) Determine the efficiency of the transformer when operating at rated voltage and delivering rated load at power factor of 0.83 lagging. (5%)
5. A three-phase, 4-pole synchronous generator is rated 13.8kV, 2500kW and has a synchronous reactance of 75Ω per phase, with negligible armature winding resistance. The machine is delivering rated power at rated voltage and a power factor of 0.9 lagging.
- (a) Find the generated voltage (magnitude and angle). (5%)
 - (b) Find the reactive power delivered. (5%)
 - (c) Find the maximum power that can be obtained for the given terminal voltage and generated voltage from part (a). (5%)
6. A three-phase, 6-pole 60Hz induction motor operates at 3% slip. (10%)
- (a) Find the stator field rotation speed (in r.p.m.).
 - (b) Find the rotor speed (in r.p.m.).
 - (c) Find the rotor field rotation speed with respect to stator winding (in r.p.m.).
 - (d) Find the frequency of the rotor current (in Hz).