國立臺北科技大學九十八學年度碩士班招生考試

系所組別：2111 電機工程系碩士班甲組

第一節　電力系統　試題

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、 (35%) Briefly explain the following questions:

1. What are the differences between the long distance and short distance transmission line models? (5%)
2. What are the functions of a distance relay? (5%)
3. What are the meanings of the swing equation? (5%)
4. How does a power plant control its output real power? (4%)
5. How does a synchronous generator control its output reactive power? (4%)
6. How does a induction generator control its output reactive power? (4%)
7. What are the functions of a Capacitive Voltage Transformer (CVT)? (4%)
8. What are the meanings of the PV bus? (4%)

二、 (16%) A 22kV three-phase Y-connected 500MVA synchronous generator has 0.1pu synchronous reactance on each phase.

1. Find the real Ohm value of the synchronous reactance （8%）
2. If the S_{base} is changed to 400MVA and the V_{base} is changed to 20kV, find the new per-unit value of the synchronous reactance. （8%）

三、(16%) In fig.1, two ideal voltage sources V_1 and V_2 are connected by an impedance Z.

1. Which voltage source consumes the real power? What is the value of the consumed real power? （8%）
2. Which voltage source generates the reactive power? What is the value of the generated reactive power? （8%）

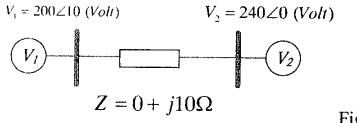

Fig.1

四、(15%) In fig.2, an unbalanced three-phase Δ-connected voltage sources

$(V_{ab} = 100\angle 0^{\circ}(Volt), V_{bc} = 80\angle -121^{\circ}(Volt), V_{ca} = 110\angle 130^{\circ}(Volt))$

is connected with a balanced Y-connected 10Ω three-phase load

1. Obtain the symmetric component of the line voltage. （5%）
2. Obtain the real power consumed in positive sequence network. （5%）
3. Obtain the real power consumed in negative sequence network . （5%）

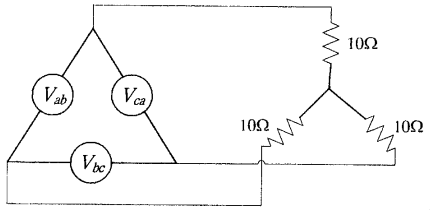

Fig.2

五、(18%) In fig.3, a system with two generators and one load has been economic dispatched. Find the generation power P_{G1}, P_{G2} and the load power P_D ,when the dispatched λ (Lagrange multiplier) is \$6/Mwh.

$IC_1 = 0.007P_{G1} + 4.1\$/Mwh$

$IC_2 = 0.007P_{G2} + 4.1\$/Mwh$,　　IC: Incremental cost, P_L: Line loss

$P_L = 0.01P_{G2}^2$

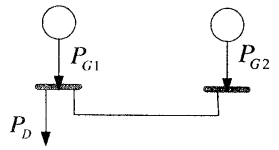

Fig.3