

國立臺北科技大學九十七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

填准考證號碼

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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、(40%) Briefly explain the meanings of the following items:

1. The transposed transmission line. (4%)
2. The burden of a current transformer (CT). (4%)
3. The surge impedance loading (SIL). (4%)
4. The impedance relay. (4%)
5. The open-delta connection of a three-phase transformer (4%)
6. The fast decoupled-power flow method (4%)
7. The swing bus (4%)
8. The equal-area stability criterion (4%)
9. How to increase the output frequency of a generator? (4%)
10. How to increase the output voltage of a generator? (4%)

二、(15%) Obtain the [Y] matrix of the power system shown in fig.1.

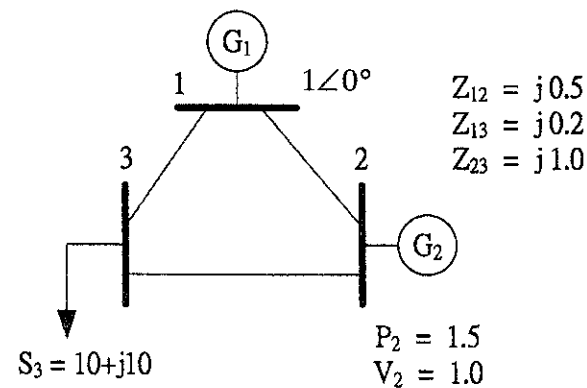


Fig.1

三、(15%) Three generator units have the following fuel-cost equations:

$$\text{Unit 1: } C_1(P_{G1}) = 600.0 + 4.6P_{G1} + 0.02P_{G1}^2$$

$$\text{Unit 2: } C_2(P_{G2}) = 200.0 + 6.0P_{G2} + 0.03P_{G2}^2$$

$$\text{Unit 3: } C_3(P_{G3}) = 100.0 + 6.6P_{G3} + 0.012P_{G3}^2$$

Determine the **economic operating point** for these three units when delivering a total of 440MW.

四、(15%) Obtain the **symmetric components** of the following three-phase unbalanced currents: $I_a = 1\angle 60^\circ$, $I_b = 1\angle -60^\circ$, and $I_c = 0$.

五、(15%) A three-phase load draws 500kVA at PF of 0.8 lagging from a 11.4KV 60Hz line.

- 1.(8%) Determine the total **reactive power** required from a capacitor bank to bring the power factor of the parallel combination up to 0.95.
- 2.(7%) If the capacitor bank is Y-connected, determine the **capacitance value** of each phase.