

# 國立臺北科技大學

一〇七學年第一學期電機系博士班資格考試

## 電力系統保護與協調 試題

第一頁 共三頁

--	--	--	--	--	--	--	--

### 注意事項：

1. 本試題共【5】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

1. (20%) Two transformer banks are connected to a common bus as shown in Fig. 1, please draw two phasor diagrams, one for the relations among the voltages  $V_{ac}, V_{cb}, V_{ba}, V_{AN}, V_{BN}, V_{CN}$  (10%), the other for  $V_{ac}, V_{cb}, V_{ba}, V_{A'N'}, V_{B'N'}, V_{C'N'}$  (10%).

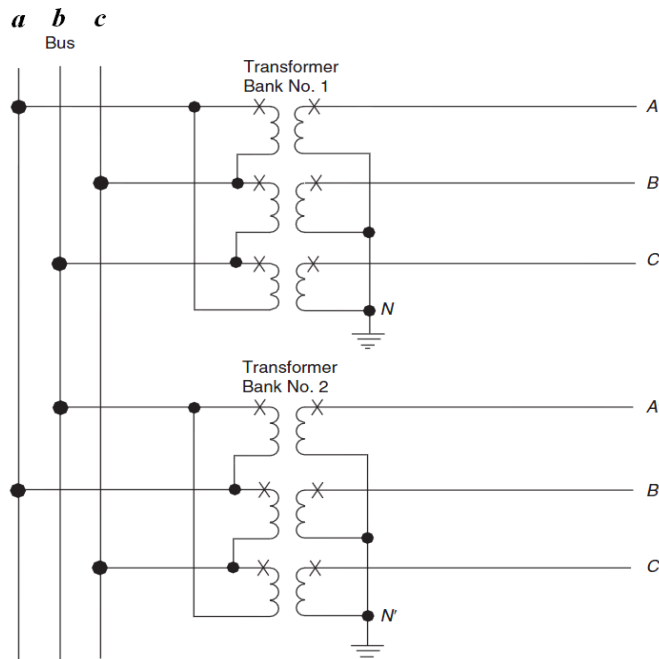


Fig. 1 For Problem 1.

2. (20%) About the series or parallel connection method of Current Transformer (CT), please explain:
  - (1). (10%) Can the saturation phenomenon of CT be improved by series or parallel connection? Why?
  - (2). (10%) Can the trip sensitivity of a relay be increased by CT series or parallel connection? Why?
  
3. (20%) A short circuit test on a 200 kVA, 7000 V–250 V transformer provides the following results: Primary voltage = 200 V at 20 primary amperes. Answer the questions below: (Round off your answers to the thousandth digit)
  - (1). (6%) Determine the per-unit impedance of the transformer.
  - (2). (7%) Calculate the ohmic impedance of the transformer on the secondary side.
  - (3). (7%) Calculate the ohmic impedance of the transformer on the primary side.
  
4. (20%) Three 5 MVA single-phase transformers, each rated 10 kV–2 kV, have a leakage impedance of 8%. They are connected into Wye–Delta (Y- $\Delta$ ) where Y is at the high voltage side and  $\Delta$  is at the low voltage side. This transformer bank supplies three identical 5  $\Omega$  resistive loads connected into  $\Delta$ . Use the three-phase base of 15 MVA and voltage base to answer the questions below: (Round off your answers to the hundredth digit)
  - (1). (6%) Calculate the per-unit load resistance.
  - (2). (7%) Determine the total per-unit impedance  $Z$  viewed from the high voltage side.
  - (3). (7%) Determine the total ohmic impedance  $Z$  viewed from the high voltage side.

5. (20%) As shown in Fig. 5(a), a simple power system has been installed three over-current protective relays A, B, and C. When a fault occurs at the point “F” indicated in Fig. 5(a), the three over-current relays are asked to trip properly. Consequently, according to the current–time settings of the curves 1, 2, and 3 depicted in Fig. 5(b), please find the correct curve number corresponding to the three over-current relays, respectively (e.g. the curve number  $x$  belongs to the relay A, etc.).

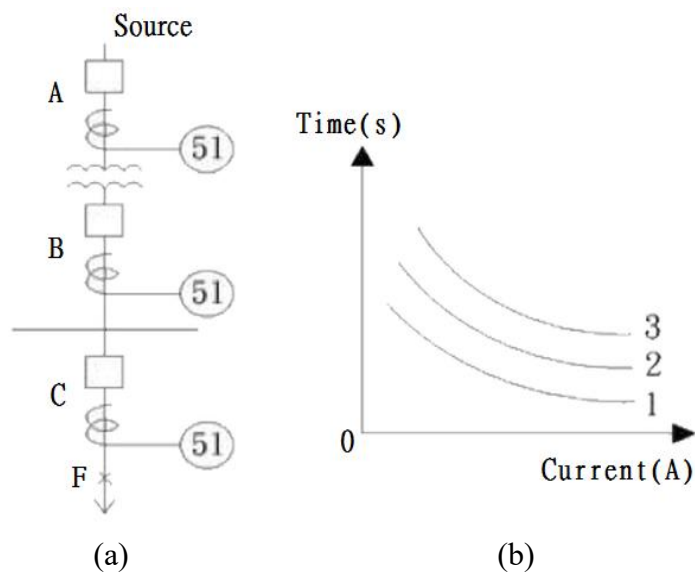


Fig. 5 For Problem 5.