

國立臺北科技大學 101 學年度碩士班招生考試

系所組別：2110 電機工程系碩士班甲組

第一節 電力系統 試題

第一頁 共一頁

注意事項：

1. 本試題共 4 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。

1. The transmission line sending-end voltage (V_S) and current (I_S) can be expressed as functions of receiving-end voltage (V_R) and current (I_R): $V_S = A V_R + B I_R$, $I_S = C V_R + D I_R$, where A, B, C and D are generalized circuit constants of the transmission line. If a medium-length transmission line is expressed as a nominal- π circuit, derive the equations of A, B, C and D as functions of total series impedance, Z, and total shunt admittance, Y, of transmission line. (20%)
2. Derive the equations of real power (P_R) and reactive power (Q_R) at the receiving end of a transmission line in terms of A and B constants, sending-end voltage (V_S) and receiving-end voltage (V_R) of transmission line. Let α , β , δ and 0° are the phase angles of A, B, V_S and V_R , respectively. Furthermore, combine the P_R and Q_R equations to form a circle equation and show the center point and radius of the circle in the complex power plane. (25%)
3. Two transformers (T_{R1} and T_{R2}) are supplied by infinite bus and parallel connected to supply a constant impedance load with rating $80+j60$ MVA 69kV. The ratings of transformers are:
 T_{R1} : 80 MVA, 161kV Δ / 69 kV Y, impedance 1.5+j 15%
 T_{R2} : 50 MVA, 161kV Δ / 69 kV Y, impedance 0.75+j 7.5%
 - (1). Draw the equivalent circuit (impedance diagram) with all transformer impedances and load impedance marked in per unit based on the rating of transformer T_{R1} , (15%)
 - (2). If the load is in rating operation, calculate infinite bus voltage magnitude in kV and secondary current magnitude in kA of each transformer. Determine which transformer occurs over current. (15%)
4. An Y-connected ideal voltage source is connected to a Δ -Y transformer rated 500 MVA, 18kV Δ / 345kV Y, with positive and negative sequence reactances of 10% and zero sequence reactance of 8% (neglecting resistance). The neutrals of ideal source and transformer are all solidly grounded. The voltage at high-tension side of transformer is 345kV when no load. Find each line current magnitude in kA at high-tension and low-tension sides of transformer for a double line-to-ground fault on phases b and c at high-tension side of transformer. (25%)