國 立 臺 北 科 技 大 學

九十八學年第一學期電機系博士班資格考試

軌道電力系統試題

注意事項：

1. 本試題共【3】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. Consider the conventional metro-rapid-transit system (MRTS) with 12 traction power substations (TSS) supplied by a main substation with two main-transformers. Draw the single-line diagram of the circuit scheme which is close-loop structure but open-loop operation under the conditions of each main-transformer supplying 6 TSS by two circuits with most balance loading. If the transformer capacities of each TSS and main substation are 6 MVA (3MVAx2) and 50 MVA (25MVAx2), respectively, and their demand factors are all of 0.8. Determine the peak loads of each TSS and main substation, respectively, and the diversity factor of MTR. (30%)
2. What is the root cause of DC stray currents from a conventional MRTS supplied by DC traction power? Describe the detrimental effects of DC stray currents. If the rail-pad-grids (RPG) and stray current collection conductors (SCCC) are connected for reducing stray currents out. Draw the schematic diagram of the connection between RPG, SCCC, rails, drain diodes, negative return bus and main ground grid at TSS. (30%)
3. Consider a railway system with Scott-connected transformer transferring balanced 161kV three-phase (3Φ) system to two 55kV single-phase (2x1Φ) system for traction power supply. Solve the following problems:
   (1). Draw the winding connection diagram, in which the polarity and turn ratio of winding should be indicated, (10%)
   (2). Drive the phasor equations for each single-phase voltage and current, (15%)
   (3).Calculate the magnitudes of positive sequence and negative sequence currents at 161kV side if only one single-phase has load current 250A at 55kV side. (15%)