國立臺北科技大學 100 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（選考）

注意事項：

1. 本試題共 3 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。

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1. Explain the following terminologies:　(25%)

    (1) bundled conductors,　(5%)

    (2) voltage regulation,　(5%)

    (3) nominal-π circuit of a transmission line,　(5%)

    (4) bus admittance matrix,　(5%)

    (5) symmetrical components. (5%)

2. Consider a power system with three buses and two generator units which are connected to bus-1 and bus-2. In this system, bus-1 is swing bus, bus-2 is PV bus with injected real power 0.5 pu and voltage magnitude1pu, and bus-3 is load bus with constant real power 0.8 pu and reactive power 0.6 pu to load. The bus admittance matrix is symmetric with self-admittances: $Y_{11}=Y_{22}=-j15pu$, $Y_{33}=-j20$ and mutual admittances: $Y_{12}=0$, $Y_{13}=Y_{23}=j10$. Solve the following problems:　(35%)

    (1). Write the injected real power equations for bus-2 and bus-3,　(12%)

    (2). Write the injected reactive power equations for bus-3,　(5%)

    (3).Calculate the jacobian matrix with all bus voltage magnitudes 1pu and phase angle 0°. (18%)

3. A 50MVA 11.4kV three-phase generator has a subtransient reactance of 25%. It is connected through a $\triangle$-Y transformer to a transmission line having a total series reactance of 50Ω. The transformer rating is 11.4kV/69kV, 75 MVA with a reactance of 22.5%. At the load end of the line, the load, represented as impedance, is drawing 40MW at 69kV and 80% power factor lagging. (40%)

    (1). Draw the one-line diagram (single-line diagram), (8%)

    (2). Draw the positive-sequence impedance diagram showing all impedance in per unit. Choose a base of 50MVA, 69kV in the load circuit,　(12%)

    (3). Determine the line-to-line voltage magnitude at the terminal of the generator, (10%)

    (4). Determine the line-to-line voltage magnitude at the load end of the line when load is removed. (10 %)