元智大學 103 學年度研究所 碩士班 招生試題卷

系(所)別：電機工程學系碩士班　組別：不分組　科目：電力系統　用紙第 1 頁共 1 頁

●不可使用電子計算機

1. (20%) Define the following keywords.
   (a) Daily load curve. (4%)
   (b) Annual load factor. (4%)
   (c) Utilization factor. (4%)
   (d) Tap changing under load (TCUL) transformer. (4%)
   (e) Smart grid. (4%)

2. (15%) A 500kV three-phase transposed line is composed of two ACSR 636,000 cmil, 24/7 Rook conductors per phase with horizontal conductor configuration as shown in Fig. 1. The conductors have a diameter of 0.977 inch and a GMR of 0.3924 inch. Bundle spacing is 18 inch.
   (a) Find the inductance (mH/km) per phase per kilometer of the line. (7%)
   (b) Find the capacitance (μF/km) per phase per kilometer of the line. (8%)

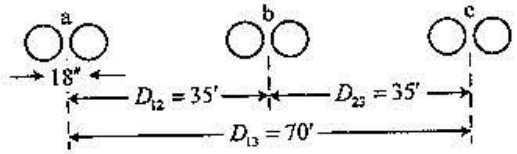

Fig. 1. Conductor layout.

3. (20%) Explain the major purposes of the following analysis in power systems.
   (a) Power flow analysis. (4%)
   (b) Short circuit analysis. (4%)
   (c) Economic dispatch analysis. (4%)
   (d) Steady-state stability analysis. (4%)
   (e) Transient stability analysis. (4%)

4. (15%) State the procedure for power flow solution by Newton-Raphson method.

5. (15%) Derive the sequence network circuit model for the unbalanced three-phase fault in Fig. 2.

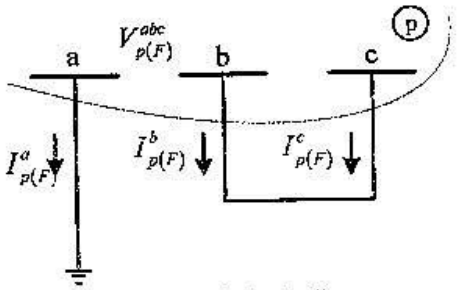

Fig. 2. Faulted circuit diagram.

6. (15%) The fuel-cost functions for three thermal plants in $/hour are given by

$$C_1 = 500 + 5.3P_1 + 0.004P_1^2$$

$$C_2 = 400 + 5.5P_2 + 0.006P_2^2$$

$$C_3 = 200 + 5.8P_3 + 0.009P_3^2$$

where the units of P_1, P_2 and P_3 are MW. The total load, P_D, is 975MW with the following generator limits (in MW).

$$200 \le P_1 \le 450$$

$$150 \le P_2 \le 350$$

$$100 \le P_3 \le 225$$

   (a) Find the optimal dispatch. (12%)
   (b) Find the total cost in $/hour. (3%)