國立雲林科技大學
97學年度碩士班入學招生考試試題

甲組

系所：電機系
科目：電力系統

1. The voltage $v(t) = 141.4\cos\omega t$ V is applied to a load consisting of a 10Ω resistor in parallel with an inductive reactance $X_L = \omega L = 3.77\Omega$. Calculate the instantaneous power absorbed by the resistor and by the inductor. Also calculate the real and reactive power absorbed by the load, and the power factor. (20%)

2. Three single-phase two-winding transformers, each rated 400MVA, 13.8/199.2kV, with leakage reactance X_{eq}=0.1 per unit, are connected to form a three-phase bank. Winding resistances and exciting current are neglected. The high-voltage windings are connected in Y. A three-phase load operating under balanced positive-sequence conditions on the high-voltage side absorbs 1000MVA at 0.9p.f. lagging, with $V_{AN} = 199.2\angle 0^o$ kV. Determine the voltage V_{an} at the low-voltage bus if the low-voltage windings are connected (a) in Y, (b) in Δ. (30%)

3. Given the symmetrical components to be $V_0 = 10\angle 0°$ V, $V_1 = 80\angle 30°$ V, $V_2 = 40\angle -30°$ V compute the unbalanced phase voltages V_a, V_b, and V_c. (10%)

4. An area of an interconnected power system has two fossil-fuel units operating on economic dispatch. The variable operating costs of these units are given by

$$C_1 = 8P_1 + 9\times 10^{-3}P_1^2 \quad \$/hr$$
$$C_2 = 10P_2 + 8\times 10^{-3}P_2^2 \quad \$/hr$$

where P_1 and P_2 are in megawatts. Determine the power output of each unit, the incremental operating cost, and the total operating cost C_T that minimizes C_T as the total load demand P_T = 900 MW. Generating unit inequality constraints and transmission losses are neglected. (20%)

5. A set of nonlinear algebraic equations in matrix format is given by

$$\mathbf{f(x)} = \begin{bmatrix} f_1(\mathbf{x}) \\ f_2(\mathbf{x}) \\ \vdots \\ f_N(\mathbf{x}) \end{bmatrix} = \mathbf{y}$$

where **y** and **x** are N vectors and **f(x)** is an N vector of functions. Given **y** and **f(x)**, we want to solve for **x**. Explain how to solve by the Newton-Raphson method. (20%)