國立台灣科技大學九十五學年度碩博士在職專班招生試題

系所組別： 電機工程系碩士在職專班甲組、電機工程系碩士在職專班甲一高職教師組

科　　目： 電力工程

總分 100 分

1. Fig.p1 shows the one-line diagram of a small industrial distribution system. The balanced three phase power system supplies a constant line voltage of 480 V(rms), and the impedance of the distribution lines is negligible. Load 1 is Δ-connected load with a phase impedance of $8\angle 30^\circ\ \Omega$, and load 2 is a Y-connected load with a phase impedance of $10\angle -36.87^\circ\ \Omega$.
   (a) Find the active and reactive powers of load 1 and load 2. (15%)
   (b) Find the total line current I_L supplied to the distribution system.(5%)

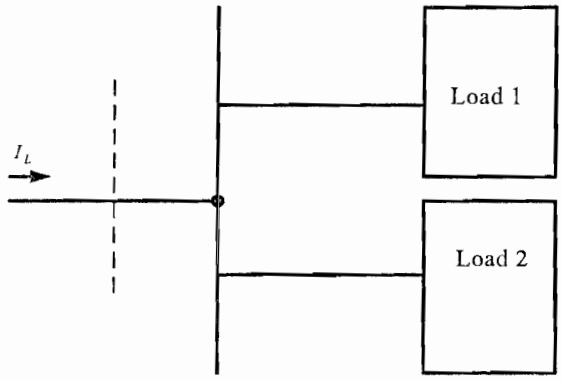

Fig.p1

2. A single phase load is shown in Fig. p2. If the current $i_L(t) = 50\sqrt{2}\cos(\omega t - 30^\circ)$ A and terminal voltage $v_L(t) = 220\sqrt{2}\cos(\omega t)$ V, calculate the apparent power and power factor of load. (10%)

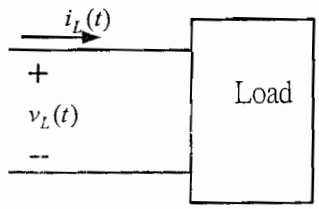

Fig.p2

3. A 50-MVA, 30-kV, three phase, 60-Hz synchronous generator has a synchronous reactance of 10Ω per phase and negligible resistance. The generator is delivering rated power at a 0.8 power factor lagging at the rated terminal voltage to an infinite bus.
   (a) Determine the excitation voltage per phase and the power angle. (10%)
   (b) If the generator is operating at excitation voltage of part (a),what is the steady-state maximum power the machine can deliver before losing synchronism? Also, find the armature current corresponding to the maximum power operation. (10%)

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4.The reactance of a generator is obtained as 0.20 per unit based on the generator's nameplate rating of 18 kV, 50MVA. Now the base is to changed to be 25 kV, 200 MVA, please find reactance on the new base. (10%)

5.Three ideal transformers are connected in the Y-Δ arrangement of Fig.p5 and are supplying a balanced, three-phase load of 200 kVA. If the line-to-line primary voltage (line a, b, c) is 4150V (rms), and the turn ratio N_1/N_2=10 of each transformer , find the effective value of primary and the secondary voltages and currents for each transformer. (20%)

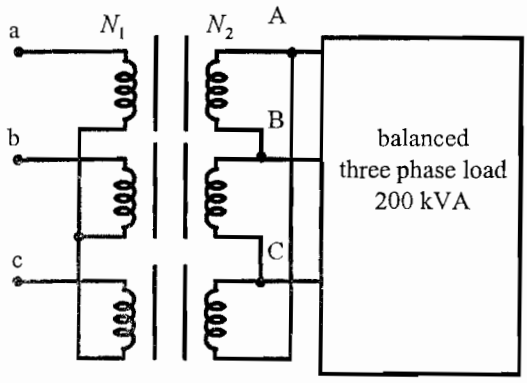

Fig.p5

6. The transmission matrix T is defined by $\begin{bmatrix}\hat{V}_S\\ \hat{I}_S\end{bmatrix}=T\begin{bmatrix}\hat{V}_R\\ \hat{I}_R\end{bmatrix}$. Find transmission matrix T for the transmission line model shown in Fig.p6. (20%)

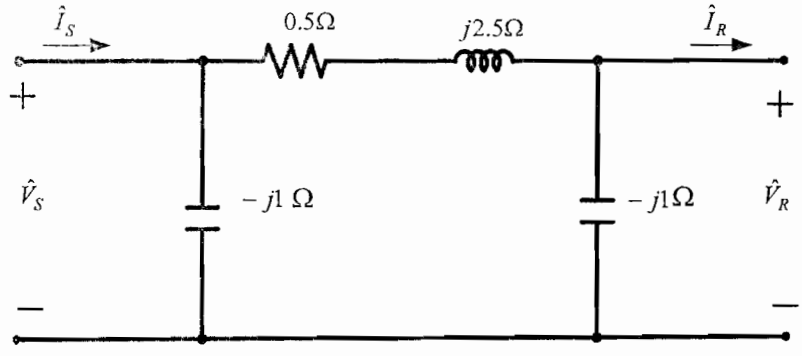

Fig.p6.