國立雲林科技大學
101 學年度碩士班暨碩士在職專班招生考試試題

系所：電機系
科目：電路學與電力系統

1. Three identical impedances $Z_1 = Z_2 = Z_3 = 30\angle 30^\circ\ \Omega$ are connected in Δ to form a balanced three-phase load as shown in **Fig. 1**. This load is supplied from a balanced three-phase voltage with $V_{an} = 100\angle 0^\circ\ V$, $V_{bn} = 100\angle(-120^\circ)\ V$ and $V_{cn} = 100\angle(120^\circ)\ V$. Find (a) the reading values of Watt meters P_A and P_B; (b) total active power delivered by the source; (c) total reactive power delivered by the source. (30%)

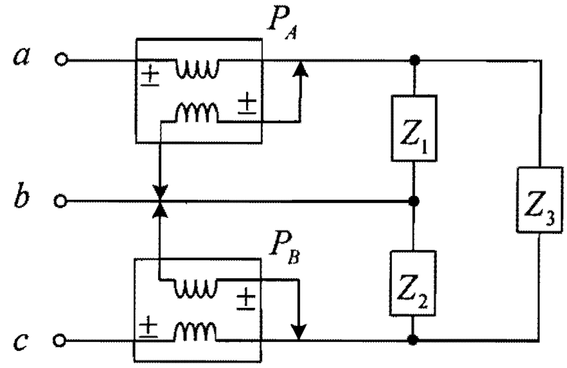

Fig. 1

2. In the circuit shown in Fig. 2, find (a) the voltage time function $v(t)$; (b) the active power and reactive power delivered by current source $i_1(t)$. (20%)

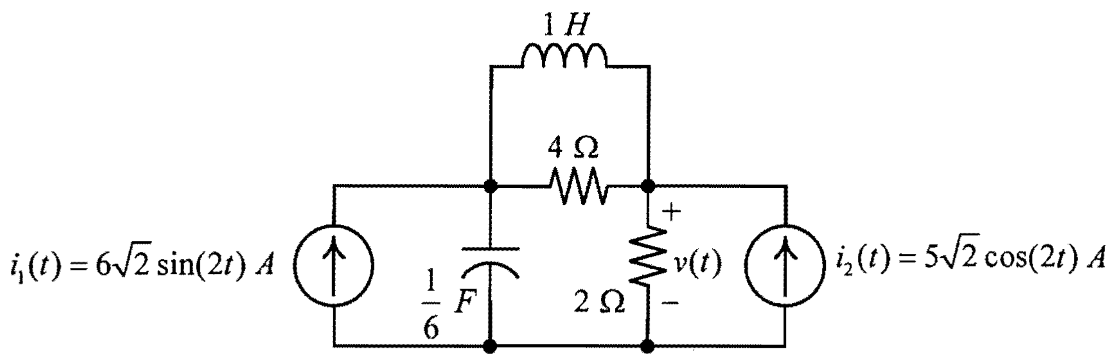

Fig. 2

3. An industrial load consisting of a bank of induction motors consumes 40 kW at a power factor of 0.8 lagging from a 220 V, 60 Hz, single-phase source. By placing a bank of capacitors in parallel with the load, the resultant power factor is to be raised to 0.95 lagging. Find the net capacitance of the capacitor bank in μF that is required. (10%)

4. A single-phase 100 kVA, 2400/240 V, 60 Hz distribution transformer is used as a step-down transformer. The load, which is connected to the 240 V secondary winding, absorbs 80 kVA at 0.8 power factor leading and at 230 V. Assuming an ideal transformer, calculate the following: (a) primary voltage, (b) load impedance, (c) load impedance referred to the primary, and (d) the real and reactive power supplied to the primary winding. (15%)

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5. A 60 Hz single-phase, two-wire overhead line has solid cylindrical copper conductors with 1.5 cm diameter. The conductors are arranged in a horizontal configuration with 50 cm spacing. The line length is 20 km. For the single-phase line, calculate: (a) the total inductance in H and the total inductive reactance in Ω, (b) the line-to-line capacitance in F and the line-to-line admittance in S. (15%)

6. A 20 km, 34.5 kV, 60 Hz three-phase line has a positive-sequence series impedance $z = 0.19 + j0.34\,\Omega/\text{km}$. The load at the receiving end absorbs 10 MVA at 0.9 power factor lagging and at 33 kV. Assuming a short line, calculate: (a) the *ABCD* parameters, (b) the sending-end voltage. (10%)