

- Q1. A power amplifier has an output impedance of $40 + j8\Omega$. It produces a no-load output voltage of 146 V at 300 Hz. What is the load power under the condition achieving maximum power transfer? (5 %)
 (A) 133.2 W (B) 65.3 W (C) 66.6 W (D) 130.6 W
- Q2. In a TV transmitter, a series circuit has an impedance of $5\text{ k}\Omega$ and a total current of 25 mA. If the voltage across the resistor is 100 V, what is the power factor of the circuit? (5 %)
 (A) 0.965 (B) 0.95 (C) 0.857 (D) 0.6
- Q3. A three-phase 440-V, 51-kW, 60-kVA inductive load operates at 60 Hz and is wye-connected. It is desired to correct the power factor to 0.95 lagging. What value of capacitor should be placed in parallel with each load impedance? (5 %)
 (A) $426.1\text{ }\mu\text{F}$ (B) $203.46\text{ }\mu\text{F}$ (C) $135.64\text{ }\mu\text{F}$ (D) $67.82\text{ }\mu\text{F}$
- Q4. A three-phase generator supplied 3.6 kVA at a power factor of 0.85 lagging. If 2,500 W are delivered to the load and line losses are 80 W per phase, what are the losses in the generator? (5 %)
 (A) 320 W (B) 480 W (C) 860 W (D) 1020 W
- Q5. A three-phase load consists of three $100\text{-}\Omega$ resistors that can be connected in either a wye or delta configuration. Determine which connection will absorb the most average power from a three-phase source with a line voltage of 110 V, assuming zero line impedance. (10 %)
- Q6. Consider the circuits shown in Fig. 1. Both circuits have the same transformer turns ratio, $a = N_1/N_2$. Using the concept of transmission matrices (or T matrices), determine the value of Z_1 in terms of Z_2 such that the terminal behavior of both circuits is identical, assuming they share the same two-port parameters. (10%)

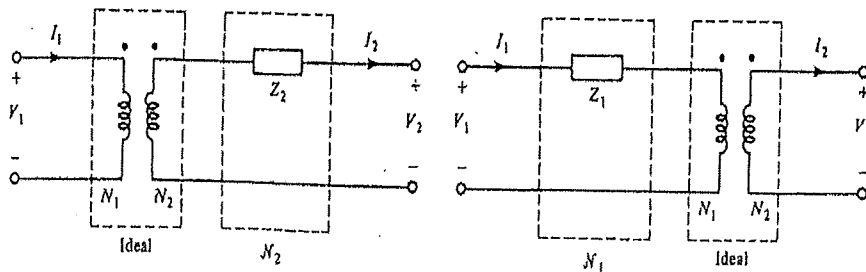


Fig. 1

- Q7. Consider the ideal rectifier shown in Fig. 2. Let $v_s(t) = V_m \sin \omega t$. Use the method of Fourier series, find the average output voltage V_{dc} of the output voltage $v_o(t)$. (10%)

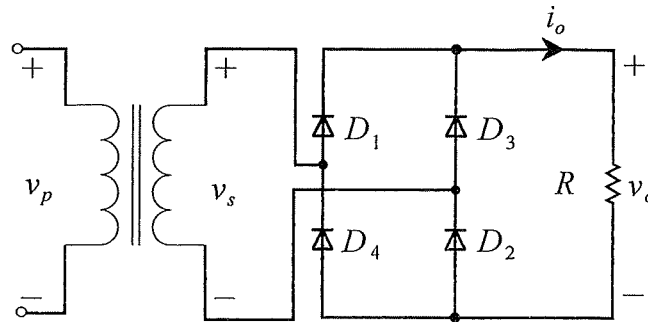


Fig. 2

Q8. Find the value of R_L in Fig. 3 for maximum power transfer and the maximum power that can be transferred to R_L using **Thevenin's theorem**. [15%]

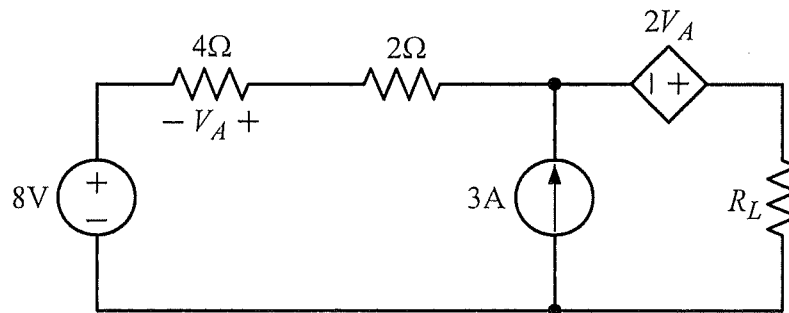


Fig. 3

Q9. Calculate $v_o(t)$ in the network in Fig. 4 if $v(t) = 20\cos(10t + 45^\circ)$ V. [15%]

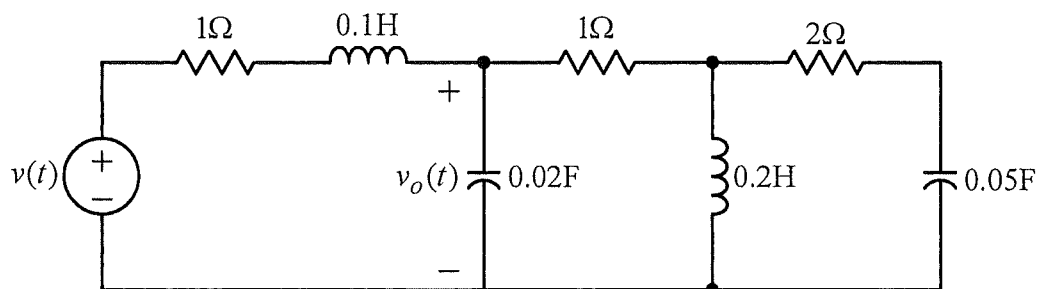
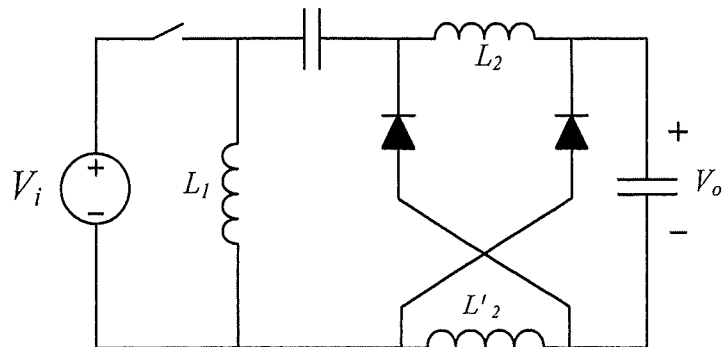


Fig. 4

Q10. Use Volt-second balance principle to prove that the following circuit, as shown in Fig. 5, is operated in continuous conduction mode and has the input-to-output transfer ratio: $V_o/V_i = D/2(1-D)$, where D is the duty ratio of the switch. (10%)



$$\frac{V_o}{V_i} = \frac{D}{2(1-D)}$$

Fig. 5

Q11. The high step-down converter is shown in Fig. 6. It is operated in continuous conduction mode and has the duty ratio D :

- (1) Derive the input-to-output transfer ratio in terms of D . (5%)
- (2) Determine the voltage stress imposed on switch S . (5%)

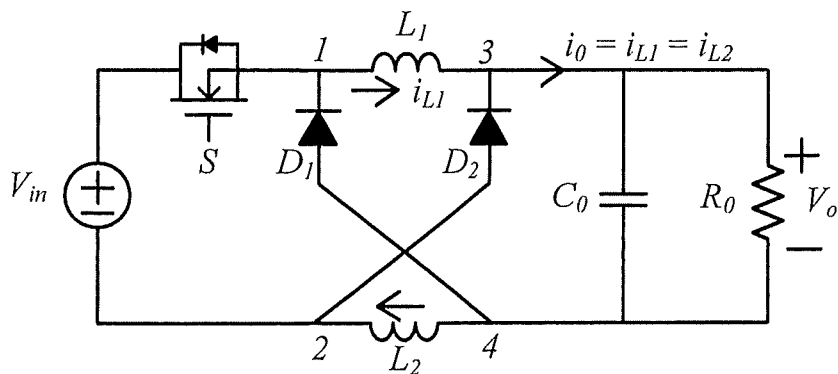


Fig. 6