

科目	電力系統及電力電子	適用系所	電機工程學系電磁與能源組	時間	100 分鐘
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※請務必在答案卷作答區內作答。 共 2 頁 第 1 頁

1. A synchronous generator is connected to an infinite bus. It delivers 1.0 per unit current at 1.0 per unit voltage and 0.95 lagging power factor. The reactance of the generator is 1.0 per unit. Determine (a) the internal voltage in per unit, (b) real power in per unit, (c) reactive power in per unit, and (d) power angle. (16%)
2. A single-phase 60 Hz, 50 kVA, 2400/240 V distribution transformer is used as a step-down transformer. (a) What load impedance connected to the secondary side will cause the transformer to be fully loaded. (b) Find the value of the resistance load in ohms seen from the primary side when a resistance load of 10Ω is connected across the secondary side. (Assume it is a real transformer) (20%)
3. A three-phase 100 km, 60 Hz transmission line with series impedance of $0.15 + j 0.78 \Omega/\text{km}$ and a shunt admittance of $j 5.0 \times 10^{-6}$ -mhos/km. Find (a) the ABCD parameters of the line (Nominal- π circuit), and (b) the characteristics impedance \bar{Z}_c in ohms of the line. (14%)
4. Consider a rectifier circuit shown in Figure 1, the $V_p = 48 \text{ V}$ and $R = 1 \text{ k}\Omega$. (a) Sketch the waveforms of the V_o and V_s . (Both the magnitude and period of the V_o and V_s shown in figure are required.). (5%) (b) Find the Peak Inverse Voltage (PIV) of the D1 and D2, respectively. (5%) (c) Which diodes are turned on and off during the positive half cycle of the input voltage, V_s . Assume the constant voltage drop model of the diode is used for problem (a) to (c). (5%) (d) Calculate the average value of the V_o if the ideal diode is used. (5%)

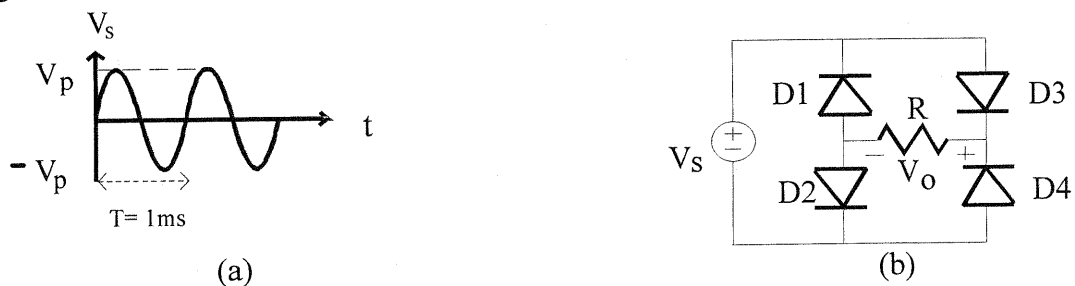


Figure 1 (a) The input voltage, V_s . (b) The rectifier circuit.

5. Consider the phase controlled rectifier shown in Figure 2, with $V_p = 170 \text{ V}$ and $R = 2 \text{ k}\Omega$. The firing delay angle, α , of thyristor, T_1 is 30° . (a) Sketch the waveforms of the V_o and V_s . (Both the magnitude and period of the V_o and V_s shown in figure are required.). (5%) (b) Find the average output voltage of V_o and the average output current of i_o . (10%)

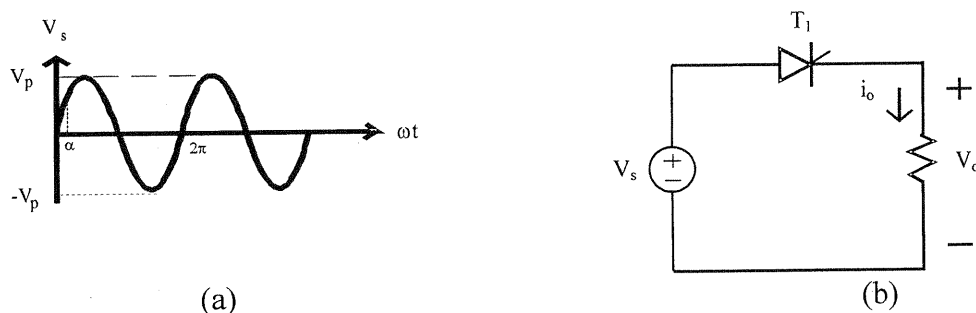


Figure 2 (a) The input voltage, V_s . (b) The thyristor controlled rectifier circuit.

6. A dc/dc converter with the input voltage $V_g = 20\text{ V}$ is shown in Figure 3. The chopping frequency is $f = 20\text{ kHz}$. The peak-to-peak ripple output voltage, ΔV_c is 10 mV . The peak to peak ripple current, ΔI of inductor, L_e is limited to 0.5 A . (a) What is the type of converter? (Buck, Boost, Cuk, or Buck-Boost converter) (5%) (b) Describe the operation of this converter. (5%) (c) Dervie the expression for V_o in terms of the components in Figure 3. (5%)

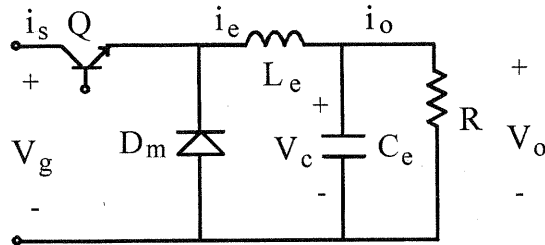


Figure 3