

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

- A single-phase, 50-kVA, 2400/120-V, 60-Hz transformer has the following data:
 Core loss at full load = 400-W; Copper loss at half load = 200-W.
 Determine the efficiency of the transformer when it delivers rated load at 0.8 power factor lagging. (10%)
- Consider a single-phase load with an applied voltage $v(t) = 110\sqrt{2} \cos(\omega t + 20^\circ)$ V and load current $i(t) = 5\sqrt{2} \cos(\omega t - 40^\circ)$ A.

 - Find the rms values of the voltage and current. (8%)
 - Find the power factor and specify whether it is lagging or leading. (8%)
 - Calculate the reactive power (Vars) supplied by capacitors in parallel with the load that correct the power factor to 0.95 lagging. (8%)
- A 60-Hz, 8-pole, three-phase synchronous generator has a mechanical input power of 30-kW.

 - Find the speed of the machine in rpm? (8%)
 - How much the input torque the machine in $N \cdot m$? (8%)
- A half-bridge inverter supplied by $V_{dc} = 200$ V, under a resistive load of $R = 10 \Omega$ is shown in Figure 1(a). The C_1 and C_2 are equal and very large, so that RC_1 and RC_2 are much larger than the half switching period. The switching MOSFETs of Q1 and Q2 are switched on and off alternatively at a 50% duty cycle with a frequency of 400 Hz. The gate signals of Q1 and Q2 are shown in Figure 1(b).

 - Sketch the current and voltage waveforms for i_L , i_s , V_{ds1} and V_{ds2} . (10%)
 - Determine the average output voltage, the rms output voltage and the rms output current. (10%)

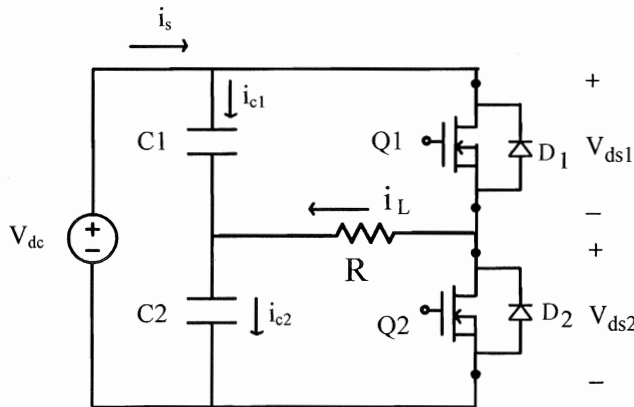


Figure 1(a)

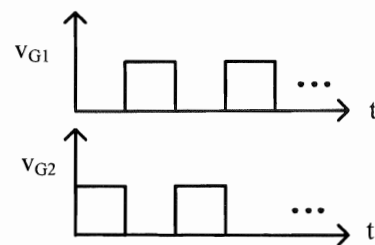


Figure 1(b)

- Sketch the circuit scheme for a half-bridge dc/dc converter and explain it in detail. (Waveforms of related voltage and current shall be included.) (15%)

6. A passive rectifier circuit is shown in Figure 2, L is very large, such that the inductive current $i_L(t)$ is continuous. All components are assumed ideal and $V_s(t) = 398\cos(377t)$ V, load = 40Ω .
- (a) Determine the dc output voltage, current, and power. (9%)
- (b) Sketch the ac line current waveform, $i_s(t)$ and the rectifier output voltage waveform $V_L(t)$. (6%)

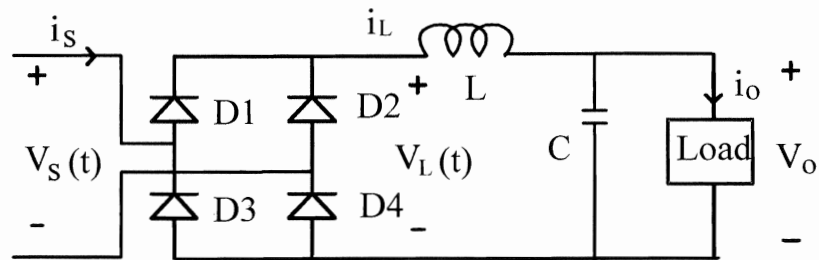


Figure 2