

國立臺北科技大學

九十八學年第一學期電機系博士班資格考試

電力電子電路分析與設計試題

第一頁 共二頁

--	--	--	--	--	--	--	--

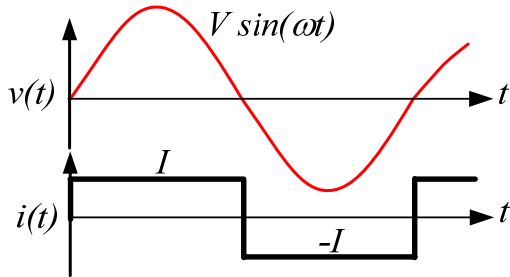
注意事項：

可以使用計算機

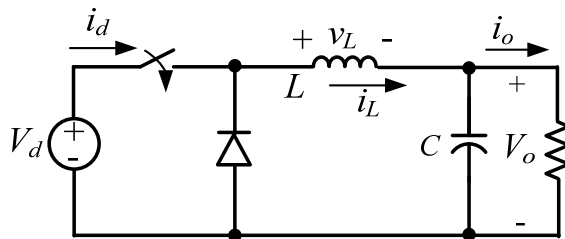
1. 本試題共【6】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

1. (10%) Explain what is synchronous pulse width modulation (PWM) and asynchronous pulse width modulation for full bridge DC-AC inverters?
2. (10%) When using diodes and MOSFETs as switches in power electronic circuits, what are the most important considerations?
3. (20%) Consider the following signal: $v(t) = 3.0 \sin(100t) + 1.0 \sin(300t + 30^\circ)$, answer the following questions:
 - (a) What is the rms value of $v(t)$ = ?
 - (b) What is the total harmonic distortion (THD) of $v(t)$ = ?

4. (20%) The voltage and current waveform of a power supply is shown in the following circuit. Find the **power factor** of this power supply = ?



5. (20%) Following circuit is a DC-DC converter, C is very large so V_o can be assumed a constant. The range of the input voltage V_d is between 16V~24V, the output voltage V_o is fixed at 12V, and the minimum output power is 6W. Switching frequency is 50kHz and D is the duty of the power switch. Find the range of the inductance L such that the converter is operating in the **continuous conduction mode**?



6. (20%) Following circuit is a full bridge DC-DC Converter. Bipolar switching is used to control the switches. PWM control signal is $v_{control}$, triangular signal is v_{tri} and its maximum value is denoted as \hat{v}_{tri} . If at an instant $v_{control} = 0.5 \hat{v}_{tri}$, answer the following questions:

- (a) What is the **average** value of $v_{AB} = ?$
 (b) Analyze i_d waveform, is i_d waveform same as i_o waveform? why?

