國 立 臺 北 科 技 大 學

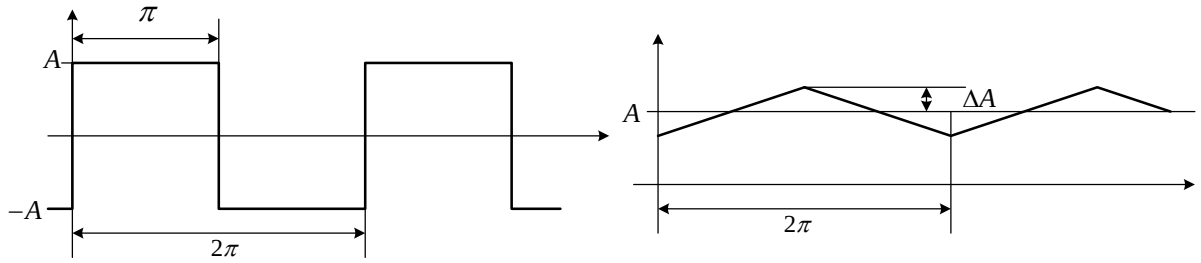
103 學年第一學期電機系博士班資格考試

電力電子學試題

注意事項：

1. 本試題共七題，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。
5. 可使用計算器。

1. For the waveforms in Fig.1, calculate their rms values. (12%)



(a)　　(b)

Fig.1

2. In the single phase rectifier circuit of Fig.2 with $i_d = I$ and $v_s = V\sin\omega t$, obtain the THD of i_s [5%] and power factor[5%].

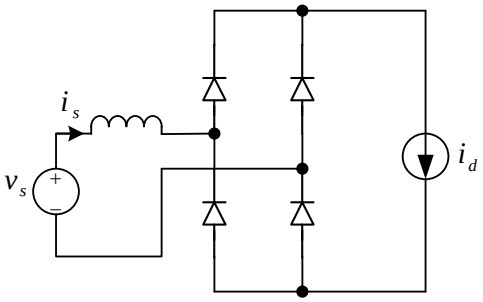


Fig. 2

3. If the following converter operates in DCM and all components are ideal,
   (a)sketch in turn the waveforms of PWM $(= v_{gs})$, i_L, i_o, v_L [12%].
   (b)calculate boundary current of inductor (L) [8%]
   (c)derive the voltage conversion gain $\frac{V_o}{V_d}$, where the duty ratio is D[8%]

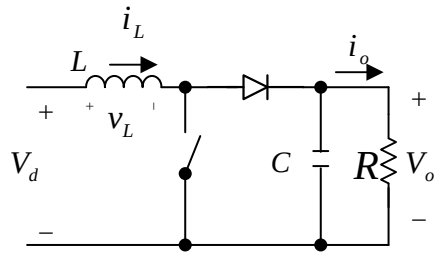


Fig. 3

4. Please find and prove the voltage conversion gain of the idealized buck converter operating in DCM with constant input voltage.[10%]

5. Please find and prove the voltage conversion gain of the idealized forward converter operating in CCM.[10%]

6. Please prove that for the three phase AC-DC converter with unity power factor, the instantaneous output power is a constant value under that all components are ideal.[10%]

7. For a full-bridge dc-dc converter, shown in Fig.4, using PWM bipolar voltage switching, $v_{control} = 0.5\hat{V}_{tri}$.
   (a) obtain the voltage conversion gain[8%]
   (b) sketch in turn the waveform of switching frequency$(= v)$, v_{AN}, v_{BN} and v_o [12%]

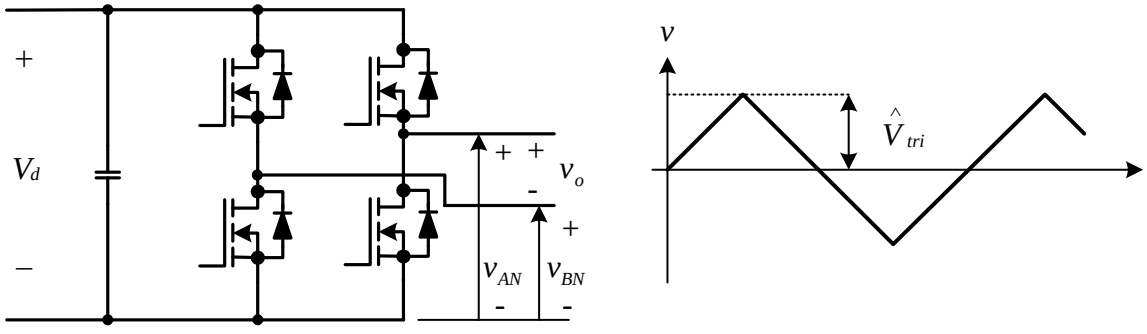


Fig. 4