

國立臺北科技大學

103 學年第二學期電機系博士班資格考試

電力電子學試題

第一頁 共二頁

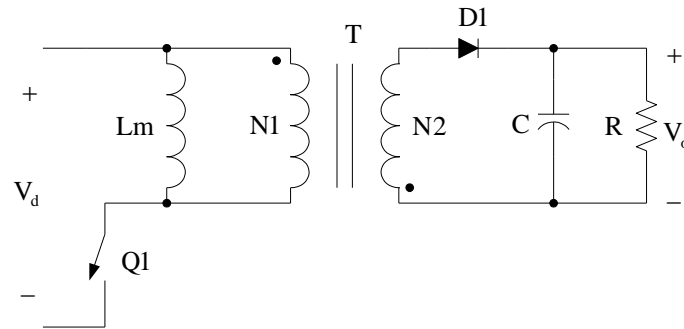
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注意事項：

1. 本試題共六題，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. Please briefly and diagrammatically illustrate the differences between the conventional linear power supplies and the switching power supplies. (15%)
2. A Cuk converter has an input of 12 V and is to have an output of -18 V supplying a 40 W load under the switching frequency $f_s=50$ kHz. Please calculate the duty ratio, the inductor sizes L_1 and L_2 such that the change in inductor currents is no more than 10 percent of the average inductor current, the output capacitor value C such that the output ripple voltage is no more than 1 percent, and the output capacitor value C_1 such that the ripple voltage across C_1 is no more than 5 percent. (20%)
3. In Boost converter operating in discontinuous current conduction mode (DCM) under switching frequency 50kHz, the output voltage is regulated at 48V by modulating the duty cycle while the input voltage varies from 12V to 36V, and the maximum output power equals to 120W, please design the desired inductance if all the elements are ideal and the output capacitance is large enough. (15%)

4. Please illustrate the operations of Flyback converter in continuous current conduction mode (CCM), including the equivalent circuits for each state, the derivation of voltage ratio, waveforms on the magnetizing winding and the output inductor, and the relationship between duty cycle and turns of the demagnetizing winding. (20%)



5. Please illustrate the primary steady-state properties of the voltages and currents on inductor and capacitor used in the power converters. (20%)
6. Please find the output current of buck converter while operating in boundary current conduction mode (BCM) and explain how to determine the operation mode between continuous current conduction mode (CCM) and discontinuous current conduction mode (DCM). (10%)

