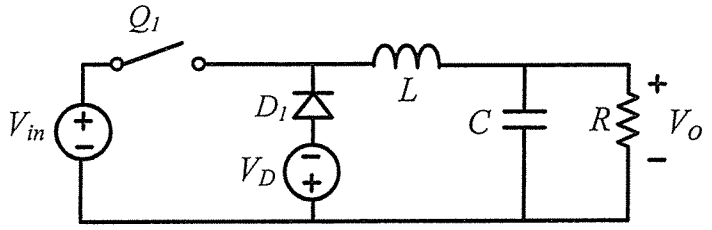
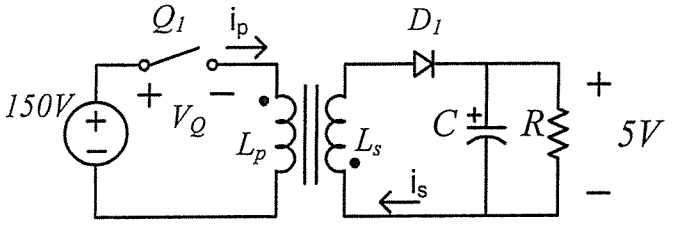
1. A DC-DC Buck converter is operating in steady-state. Assuming Q_1 and D_1 are ideal switches. V_D represents diode forward voltage. Output capacitance is very large. Switching frequency is f_s.



(a) Please derive duty cycle value D of Q_1 as a function of V_{in}, V_D, V_O, and L. Assuming converter operates at continuous conduction mode (CCM). (8%)

(b) What is the range of *R* for the converter to operate at CCM? (8%)

2. Given Lp=100 μH, switching frequency fs=200kHz, C=500 μF, Output power=25W. Assuming ideal switches.



Turn ratio
$n_p:n_s=15:1$

(a) Derive duty cycle value D of Q_1. (6%)
(b) Sketch the waveforms of V_Q, I_p, and I_s. Indicate important values such as peak and valley values and time values. (12%)

3. 100 KVA，1200/120 伏特，60 赫之單相變壓器，由低壓側激磁而高壓側開路。若電源為 120 伏特，低壓側量得 16 安培電流與 960 瓦特功率。試求
(a) 功因角。(10%)
(b) 磁化電流。(7%)
(c) 鐵心損失分量電流。(6%)

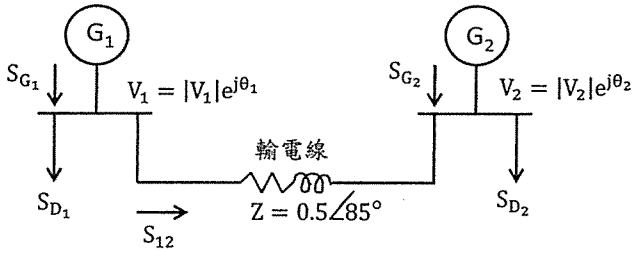
見背面

4. 10 馬力，230 伏特，3 相，60 赫之感應電動機，在額定電壓及頻率下，它的滿載轉差率為 4%，試求
   (a) 同步轉速（以 rpm 表示）。(5%)
   (b) 滿載轉速（以 rpm 表示）。(5%)

5. 正弦穩態之平衡三相電力系統，其三相電源電壓，三相輸電線阻抗及三相負載阻抗必須滿足那些條件？(10%)

6. 有一具有兩部發電機之電力系統，其輸電損失可忽略不計，總負載量為1000MW。假設兩部發電機之發電量分別為P_1及P_2，燃料成本分別為F_1及F_2，且
   $F_1 = 460 + 8.28P_1 + 0.00053{P_1}^2$
   $F_2 = 480 + 8.65P_2 + 0.00056{P_2}^2$
   試求P_1及P_2以使總燃料成本$F_1 + F_2$為最低。(10%)

7. 下圖所示為一平衡三相電力系統之單線圖。假設$|V_1| = 1.05$，$|V_2| = 0.95$，輸電線之串聯阻抗$Z = 0.5\angle 85°$，其並聯電容可忽略不計，令$\theta_{12} \triangleq \theta_1 - \theta_2$。當$\theta_{12} = 10°$時，試求 COMPLEX POWER S_{12}。(13%)



試題隨卷繳回