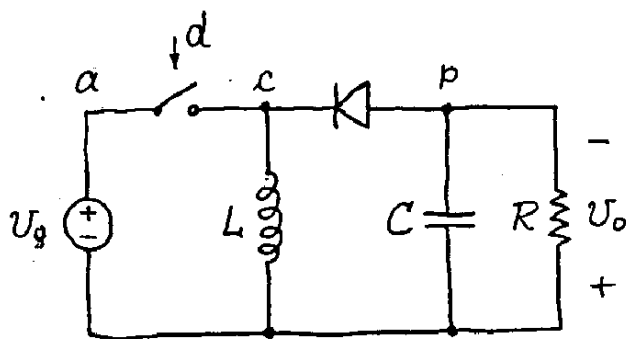


HW #5

PROB. 1

Find small-signal transfer functions for the buck-boost converter, $G_{vg}(s)$, $G_{vd}(s)$, $Z_o(s)$.



PROB. 2 Simulate average model of buck converter with $V_g = 12\text{ V}$, $V_o = 5\text{ V}$, $L = 30\mu\text{H}$, $C = 500\mu\text{F}$, $R = 0.5\Omega$, and $f_s = 50\text{ kHz}$. Find

- Bode plots of $G_{vg}(s)$, $G_{vd}(s)$, and $Z_o(s)$
- Initial transient at power-up when $i_L(0) = V_c(0) = 0$.

PROBLEM 3: Assume that all the components of the dc-dc converter in Fig. are ideal. The duty-cycle-to-output transfer function of this converter has the form:

$$G_{vd}(s) = \frac{\hat{v}_o(s)}{\hat{d}(s)} = \frac{k \cdot \left(1 - \frac{s}{2\pi \cdot f_z}\right)}{1 + \frac{1}{Q} \cdot \left(\frac{s}{2\pi \cdot f_0}\right) + \left(\frac{s}{2\pi \cdot f_0}\right)^2}$$

- Find the approximate values of k , Q , f_0 , and f_z .
- Sketch the Bode plot of $G_{vd}(j2\pi f)$ marking the coordinates of characteristic points.

$V_g = 5\text{ V}$
 $V_o = 5\text{ V}$
 $L = 100\ \mu\text{H}$
 $C = 1\ \text{mF}$
 $R = 1.26\ \Omega$

