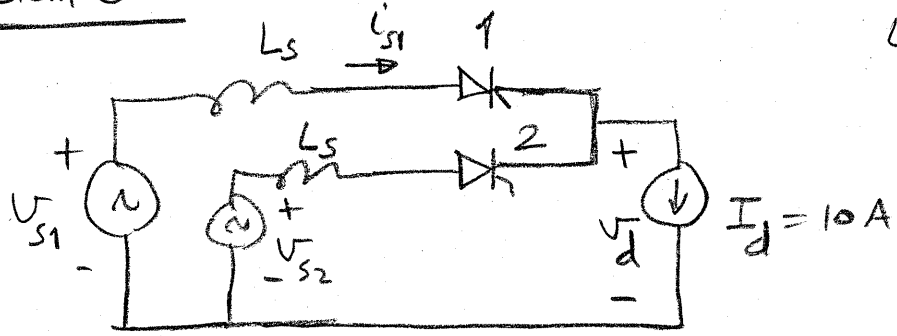
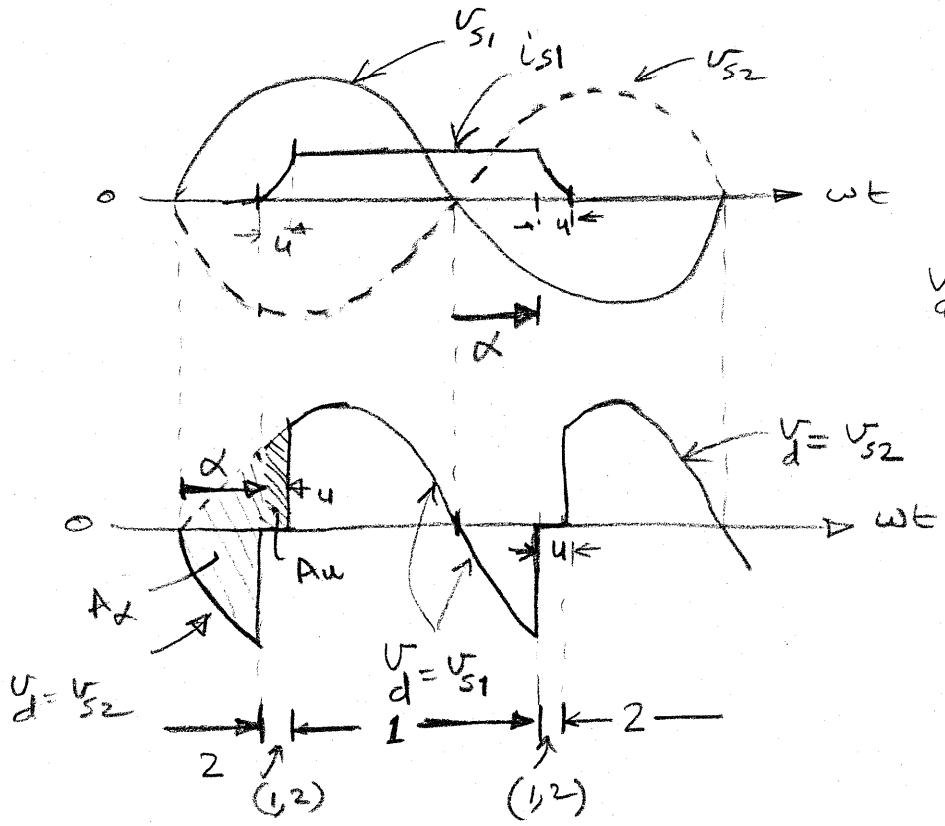
# Problem 6-1




$L_s = 5\,mH$



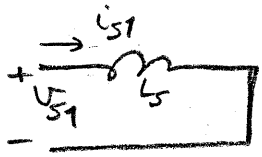

$V_d = V_{s1}$ 1 Cond.

$= V_{s2}$ 2 Cond.

$= 0$ 1, 2 Cond.

Considering $L_s$ in series with Thyristor 1 during commutation —

$i_{s1}(\alpha) = 0, \quad i_{s1}(\alpha + u) = I_d$




$V_d = 0$ during commutation

$$L_s \frac{di_{s1}}{dt} = V_{s1}$$

$$\therefore \sqrt{2}\, V_s \int_{\alpha}^{\alpha+u} \sin \omega t \cdot d(\omega t) = \omega L_s \int_0^{I_d} di_{s1}$$

$$\therefore \sqrt{2}\, V_s \left[\cos\alpha - \cos(\alpha + u)\right] = \omega L_s I_d = A_u$$

$$\therefore \cos(\alpha + u) = \cos\alpha - \frac{\omega L_s I_d}{\sqrt{2} V_s} \Rightarrow \text{Calculate } u$$

$$V_{do}\,(\alpha = 0, L_s = 0) = 0.9\, V_s, \quad V_{d\alpha} = 0.9\, V_s \cos\alpha$$

$$V_d = 0.9\, V_s \cos\alpha - \frac{\omega L_s}{\pi} I_d.$$

(a) ∴ at $\alpha = 45^\circ$ $u = 8.41^\circ$, $V_d = 70.37\,V$

(b) at $\alpha = 135^\circ$ $u = 9.9^\circ$, $V_d = -82.37\,V$