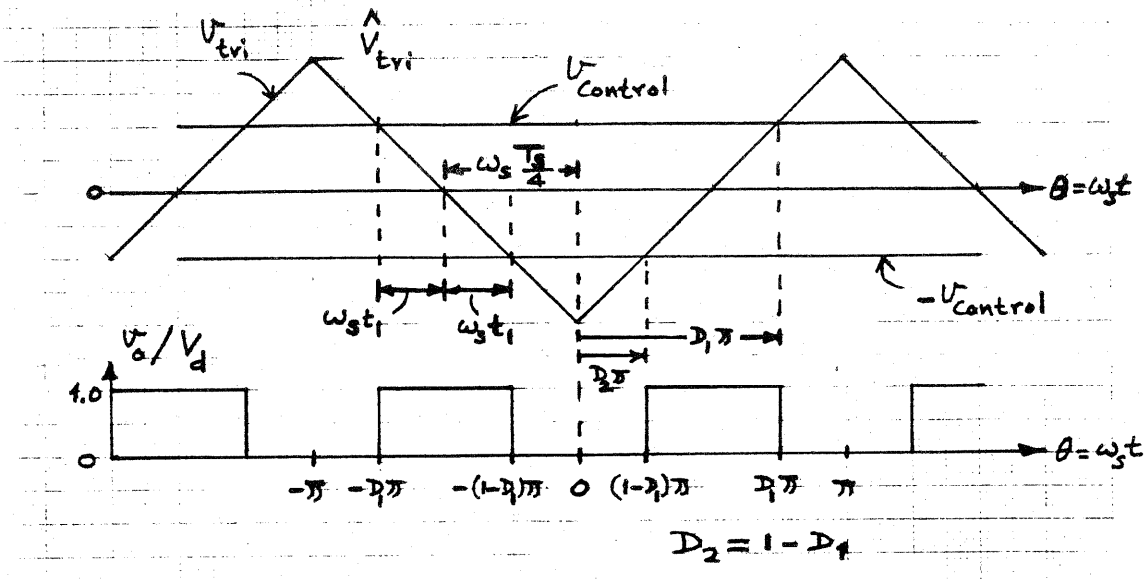
Problem 7-19




even function:

$$a_n = \frac{2}{\pi} \int_0^{\pi} f(\theta) \cdot \cos(n\theta) \cdot d\theta$$

From Eq. 7-78, $D_1 = 0.75\pi$

$$a_o = \frac{2}{\pi} \left[ \int_{0.25\pi}^{0.75\pi} (1) d\theta \right] = \frac{2}{\pi} [0.5\pi] = 1$$

$$\therefore \frac{V_o}{V_d} = \frac{1}{2} a_o = 0.5$$

$$a_n = \frac{2}{\pi} \left[ \int_{0.25\pi}^{0.75\pi} 1 \cdot \cos(n\theta) \cdot d\theta \right] = \frac{2}{n\pi} [\sin(0.75n\pi) - \sin(0.25n\pi)]$$

$$= \frac{4}{n\pi} \left[ \sin(0.25n\pi) - 2\sin^3(0.25n\pi) \right]$$

Note: We are asked to assume that $i_o(t) \simeq I_o$. Therefore, $[i_d(t)/I_o]$ waveform will be identical to the $[v_o(t)/V_d]$ waveform shown above.

Also, the Fourier components of $[i_d(t)/I_o]$ will be identical to those shown in the Table below.

Note: [$\sin 3A = 3\sin A - 4\sin^3 A$]

| n | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $\hat{V}_{on}/V_d$ | 0 | 0.64 | 0 | 0 | 0 | 0.212 |