

相互インダクタンス M

$$v(t) = v_0 e^{i\omega t}$$

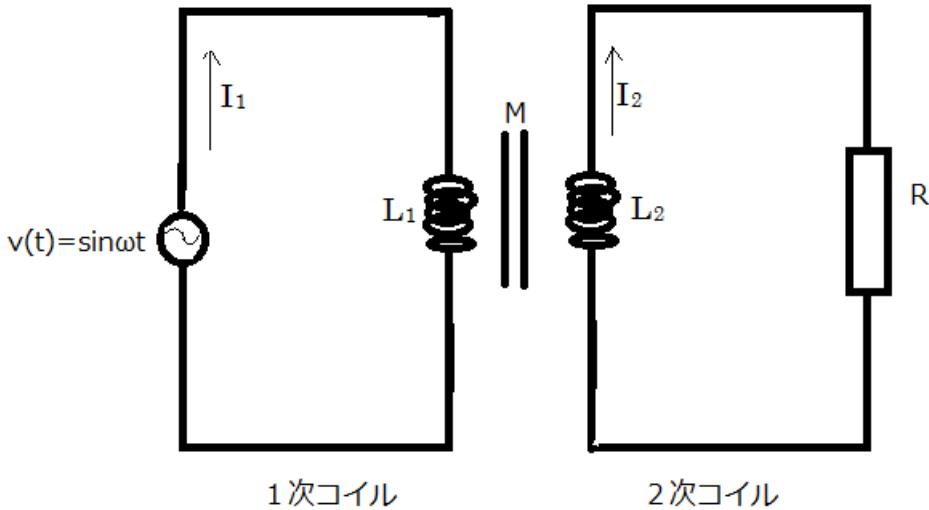
1 次コイルリアクタンス L_1

2 次コイルリアクタンス L_2

$$I_1(t) = I_1^0 e^{i\omega t}, I_1^0 =$$

$$|I_1^0| e^{i\delta}$$

$$I_2(t) = I_2^0 e^{i\omega t}, I_2^0 = |I_2^0| e^{i\delta}$$



電圧降下の式は

$$\begin{cases} L_1 \frac{dI_1}{dt} + M \frac{dI_2}{dt} = v_0 e^{i\omega t} \\ M \frac{dI_1}{dt} + RI_2 + L_2 \frac{dI_2}{dt} = 0 \end{cases}$$

$$\frac{dI_1}{dt} = I_1^0 i\omega e^{i\omega t}$$

$$\frac{dI_2}{dt} = I_2^0 i\omega e^{i\omega t}$$

$$(L_1 I_1^0 i\omega + M I_2^0 i\omega) e^{i\omega t} = v_0 e^{i\omega t}$$

$$\{M I_1^0 i\omega + I_2^0 (R + L_2 i\omega)\} e^{i\omega t} = 0$$

$$I_2^0 = \frac{M v_0}{-R L_1 + (M^2 - L_1 L_2) i\omega}$$

$$A = -R L_1 + (M^2 - L_1 L_2) i\omega = |A| e^{i\delta}$$

$$|A| = \sqrt{(R L_1)^2 + \{(M^2 - L_1 L_2) \omega\}^2} \quad \tan \theta = \frac{R L_1}{(M^2 - L_1 L_2) \omega}, \delta = \theta + \frac{\pi}{2}$$

$$I_1^0 = \frac{v_0 R + v_0 L_2 \omega i}{(M^2 \omega^2 - L_1 L_2 \omega^2) + L_1 R \omega i} = \frac{B}{C}$$

$$B = |B| e^{i\delta_1}, C = |C| e^{i\delta_2}$$

$$|B| = \sqrt{(v_0 R)^2 + (v_0 L_2 \omega)^2} \quad \tan \delta_1 = \frac{L_2 \omega}{R}$$

$$|C| = \sqrt{(M^2\omega^2 - L_1L_2\omega^2)^2 + (L_1R\omega)^2} \quad \tan \delta_2 = \frac{L_1R}{(M^2 - L_1L_2)\omega} = \tan \theta$$

$$\therefore I_1^0 = i_1^0 e^{(\delta_1 - \delta_2)} = i_1^0 \frac{\sqrt{(v_0 R)^2 + (v_0 L_2 \omega)^2}}{\sqrt{(M^2 \omega^2 - L_1 L_2 \omega^2)^2 + (L_1 R \omega)^2}}$$

$$\therefore I_2^0 = i_2^0 e^{-i\delta} = i_2^0 e^{-i(\theta + \frac{\pi}{2})}$$

$$I_1(t) \text{ と } I_2(t) \text{ の位相差 } \Delta\varphi = (\delta_1 - \delta_2) - (-\delta)$$

$$= (\delta_1 - \theta) - \left\{ -\left(\theta + \frac{\pi}{2} \right) \right\} = \delta_1 + \frac{\pi}{2}$$