(1)

$$u(t) = (L_1 + L_{12} + L_{13})\frac{di}{dt} + (L_2 + L_{12} + L_{23})\frac{di}{dt} + (L_3 + L_{13} + L_{23})\frac{di}{dt}$$

$$u(t) = \left[L_1 + L_2 + L_3 + 2L_{12} + 2L_{13} + 2L_{23}\right]\frac{di}{dt}$$

$$L_e = L_1 + L_2 + L_3 + 2L_{12} + 2L_{13} + 2L_{23}$$

$$L_{12} = 0{,}5\sqrt{L_1 L_2} \qquad L_{13} = -0{,}5\sqrt{L_1 L_3} \qquad L_{23} = -0{,}5\sqrt{L_2 L_3}$$

$$L_e = L_1 + L_2 + L_3 + \sqrt{L_1 L_2} - \sqrt{L_1 L_3} - \sqrt{L_2 L_3}$$

(2)

$$\boxed{R = \frac{P}{I^2}} \qquad \boxed{Q = \sqrt{(UI)^2 - P^2}} \qquad X_L = \frac{Q}{I^2} = \frac{\sqrt{(UI)^2 - P^2}}{I^2}$$

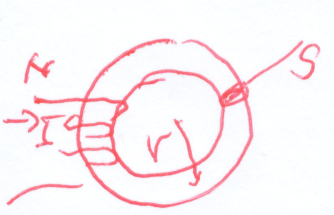
$$\boxed{L = \frac{\sqrt{(UI)^2 - P^2}}{2\pi f I^2}}$$

(3)

$$\underline{I}_1 = \frac{\sqrt{2}}{2} \qquad \underline{I}_2 = \frac{\sqrt{2}}{2}\left[\frac{1}{2} - j\frac{\sqrt{3}}{2}\right] \qquad \underline{I}_3 = \underline{I}_1 + \underline{I}_2 = \frac{\sqrt{2}}{2}\left[\frac{3}{2} - j\frac{\sqrt{3}}{2}\right]$$

$$\underline{I}_3 = \sqrt{3}\cdot\frac{\sqrt{2}}{2}\left[\frac{\sqrt{3}}{2} - j\frac{1}{2}\right] = \sqrt{3}\,\frac{\sqrt{2}}{2}\left[\cos 30^\circ - j\sin 30^\circ\right]$$

$$i_3 = \sqrt{3}\cdot\sin(\omega t - 30^\circ$$



$$W_M = \frac{1}{2}LI^2 \qquad L = \frac{N^2}{R_m} \qquad R_m = \frac{1}{\mu}\cdot\frac{2r\pi}{S}$$

$$W_M = \frac{1}{2}N^2 I^2 \frac{\mu\cdot S}{2r\pi} = \frac{1}{4}N^2 I^2 \frac{\mu S}{r\pi}$$

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$$E = Ri + L\frac{di}{dt} \qquad i(0)=0$$

$$\frac{di_L}{dt} + \frac{R}{L} = \frac{E}{L} \qquad i_L(t) = \frac{E}{R}\left(1 - e^{-t/\tau}\right) \qquad \tau = \frac{L}{R}$$

$$u_L(t) = L\frac{di_L}{dt} = E \cdot e^{-t/\tau}$$