RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

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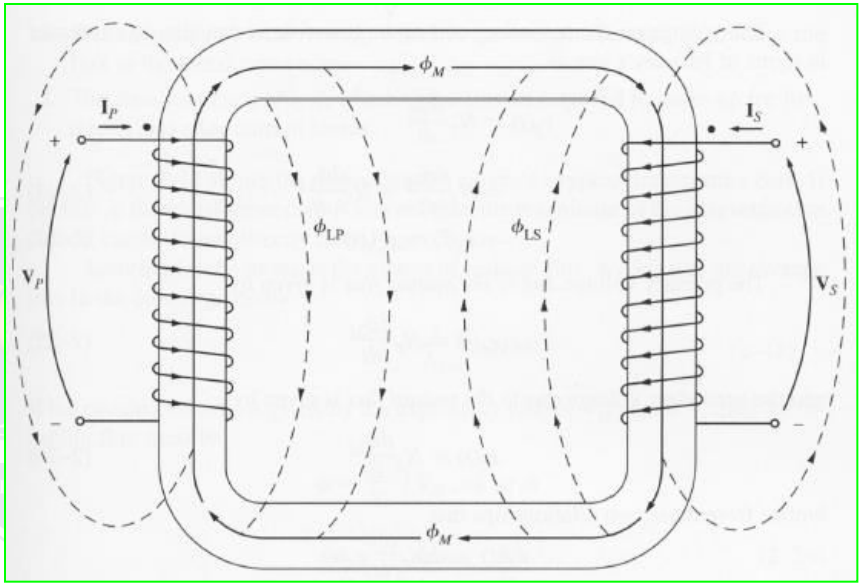
Theory of Operation of Single-phase Real Transformers

$$\phi_P = \phi_M + \phi_{LP}$$
$$\phi_S = \phi_M + \phi_{LS}$$



f_p: total average primary flux

f_M : flux linking both primary and secondary windings

f_{LP}: primary leakage flux

f_S: total average secondary flux

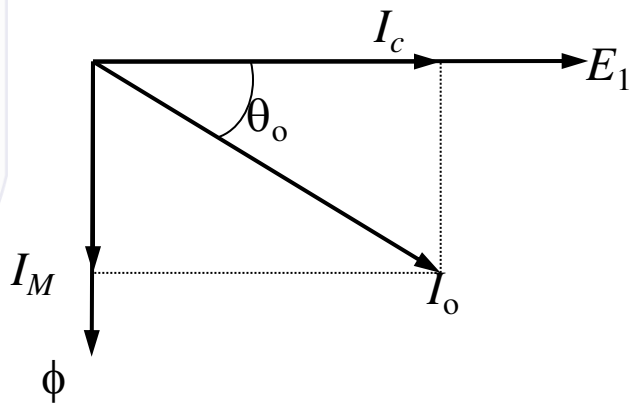
f_{LS}: secondary leakage flux

The Magnetization Current In a Real Transformer

When an ac power source is connected to the primary of a transformer, a current flows in its primary circuit, even when there is no current in the secondary. The transformer is said to be on no-load. If the secondary current is zero, the primary current should be zero too. However, when the transformer is on no-load, excitation current flows in the primary because of the core losses and the finite permeability of the core.

Excitation current, I_o

- Magnetization current I_M (current required to produce flux in the core)
- Core-loss current I_{h+e} (current required to make up for hysteresis and eddy current losses)



I_M is proportional to the flux f

$I_c = I_{h+e}$ = Core loss/E_1