PHASOR DIAGRAM OF TRANSFORMER

Prepared By
ELECTRICALBABA.COM

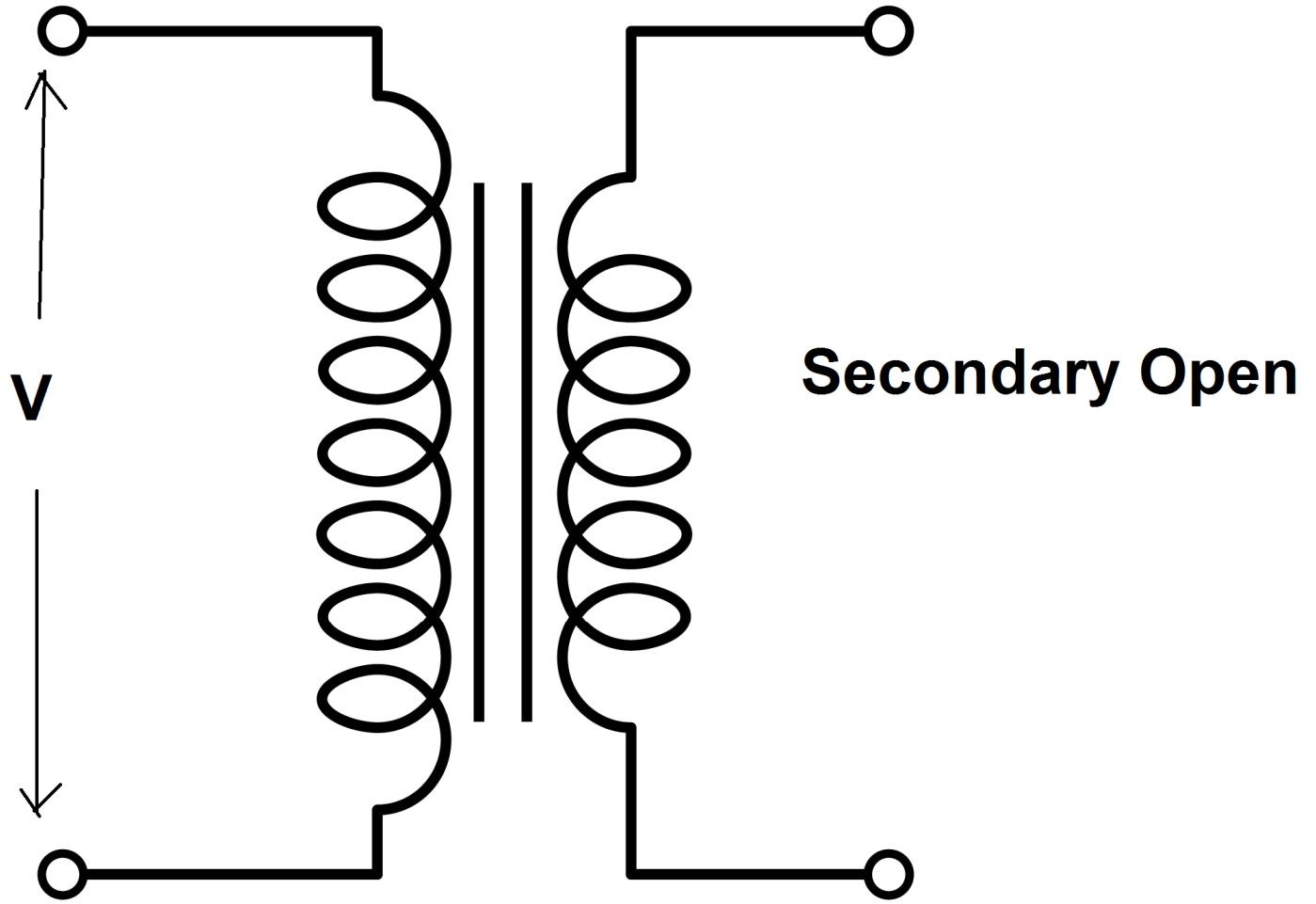
IMPORTANT POINTS FOR PHASOR OF TRANSFORMER

- Transformer when excited at no load, only takes excitation current which leads the working Flux by Hysteretic angle α.
- Excitation current is made up of two components, one in phase with the applied Voltage V is called Core Loss component (Ic) and another in phase with the working Flux Ø called Magnetizing Current (Im).
- Electromotive Force (EMF) created by working Flux Ø lags behind it by 90 degree.
- When Transformer is connected with a Load, it takes extra current I' from the Source so that $N_1I' = N_2I_2$ where I' is called load componete of Primary Current I 1 .

IMPORTANT POINTS FOR PHASOR OF TRANSFORMER

- So under load condition, I_1 = Primary Current, is phasor Sum of I' and Excitation Current Ie.

NO LOAD PHASOR OF A TRANSFORMER

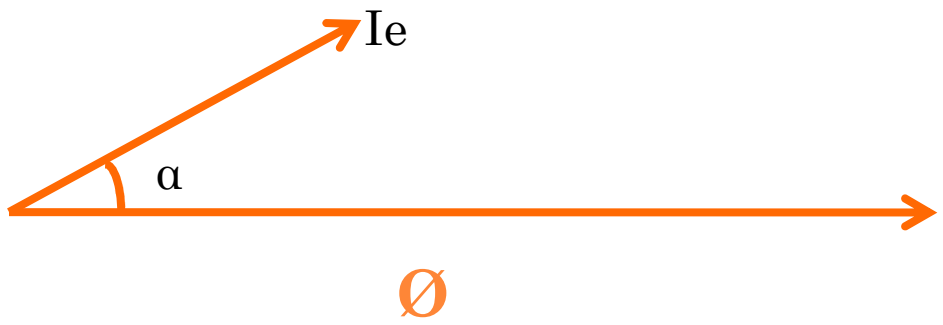


NO LOAD PHASOR OF A TRANSFORMER

- Working Flux Ø taken as Reference

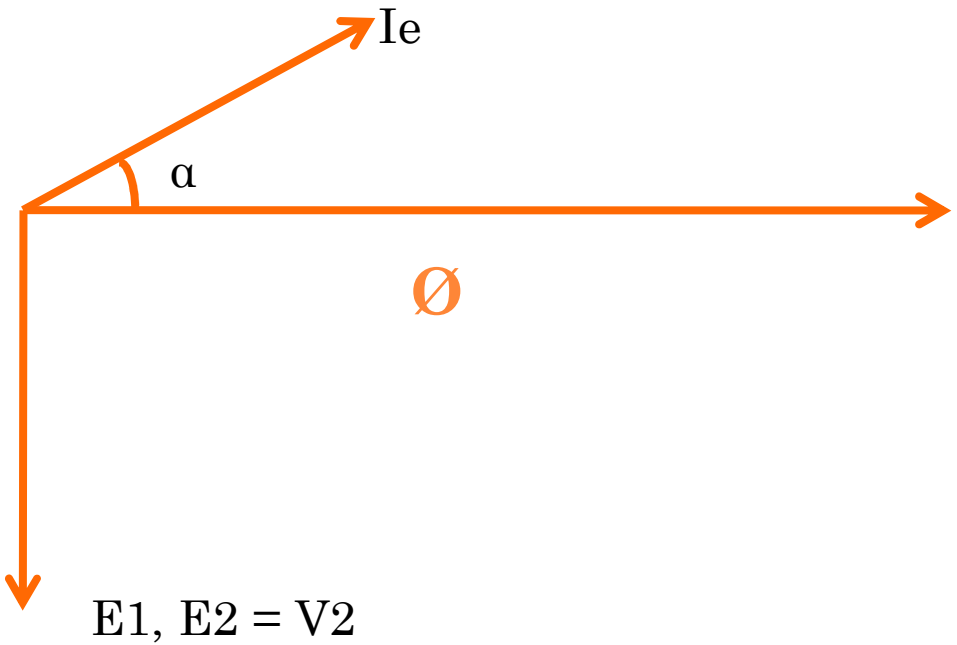
NO LOAD PHASOR OF A TRANSFORMER

- Excitation Current Ie leading Ø by α.



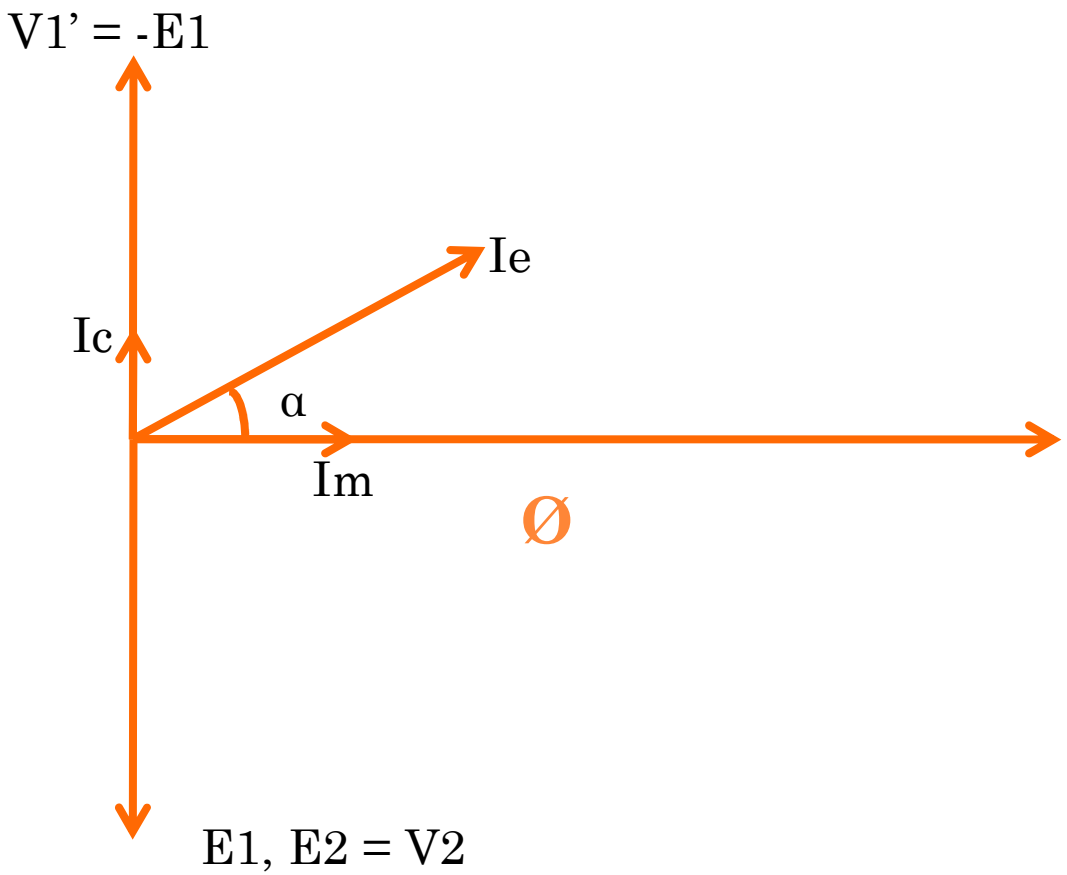
NO LOAD PHASOR OF A TRANSFORMER

- Induced EMF E1 and E2 lagging Flux by 90 degree.



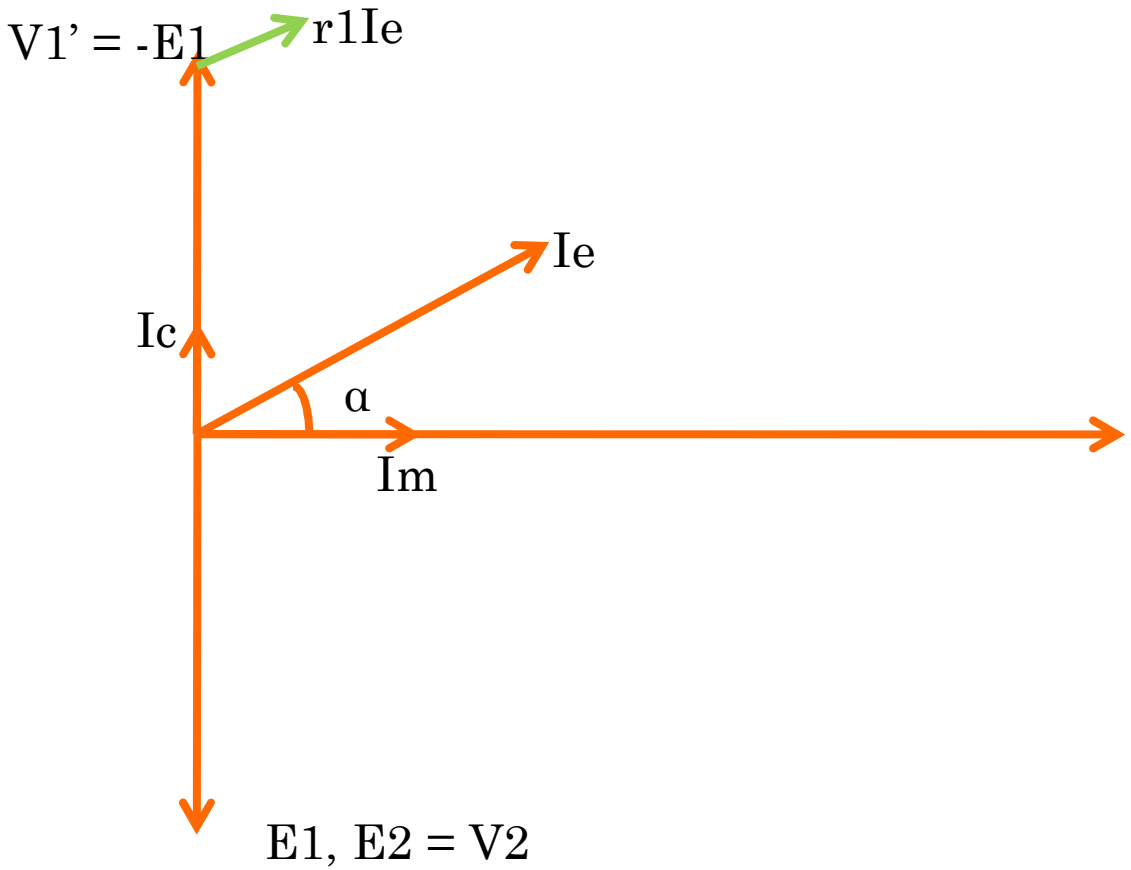
NO LOAD PHASOR OF A TRANSFORMER

- V1’ = -E1



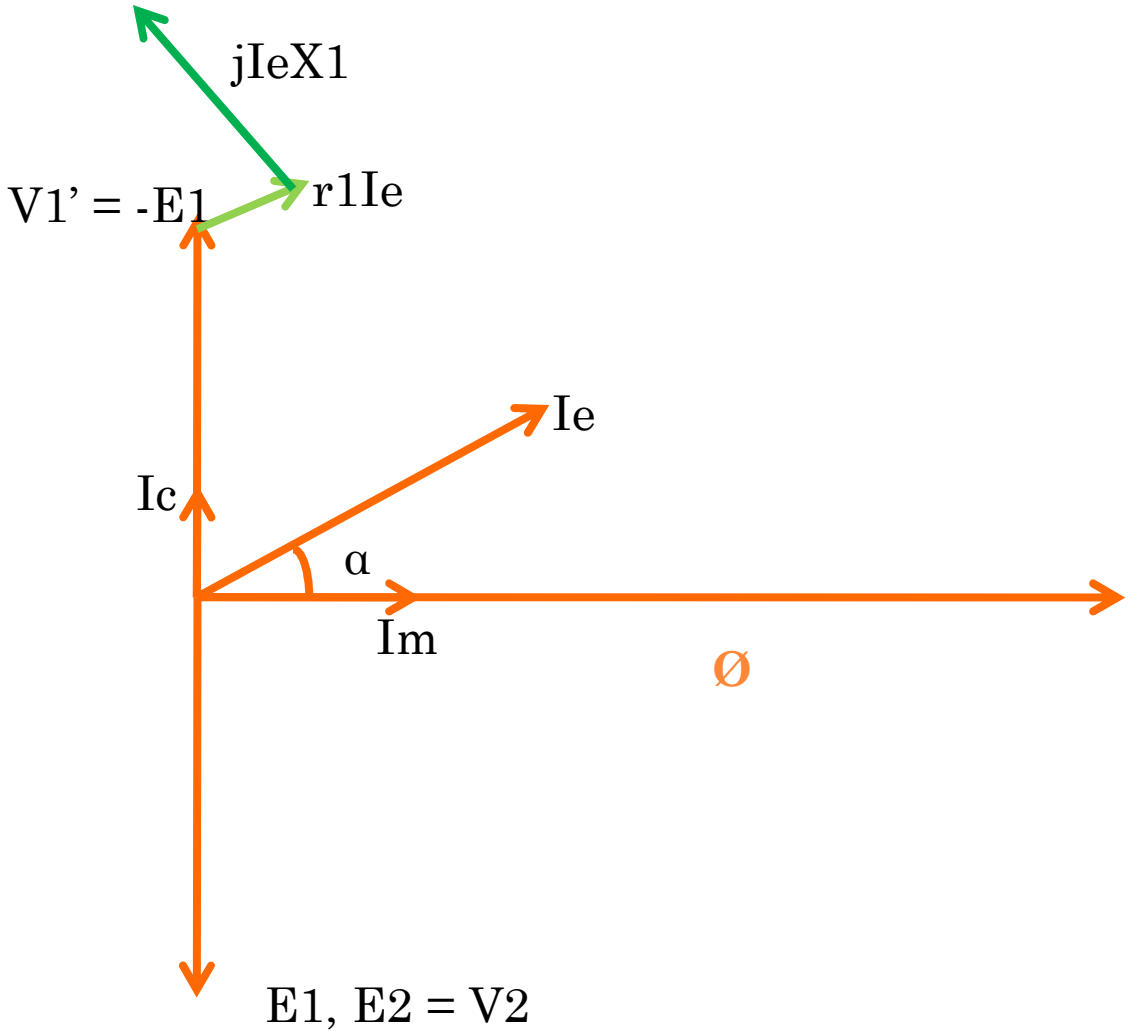
NO LOAD PHASOR OF A TRANSFORMER

- Voltage drop r1Ie in Primary.



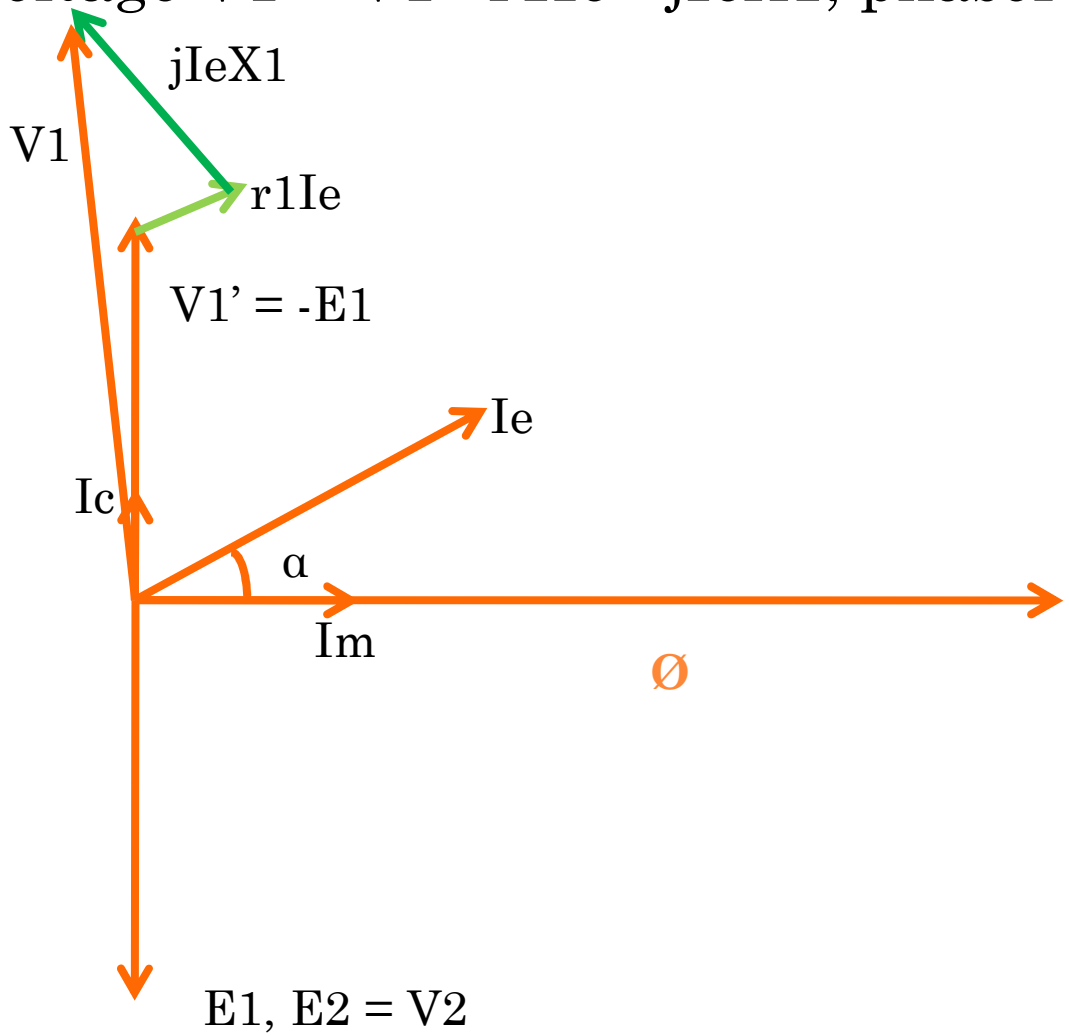
NO LOAD PHASOR OF A TRANSFORMER

Voltage drop IeX1 in Primary due to reactance.



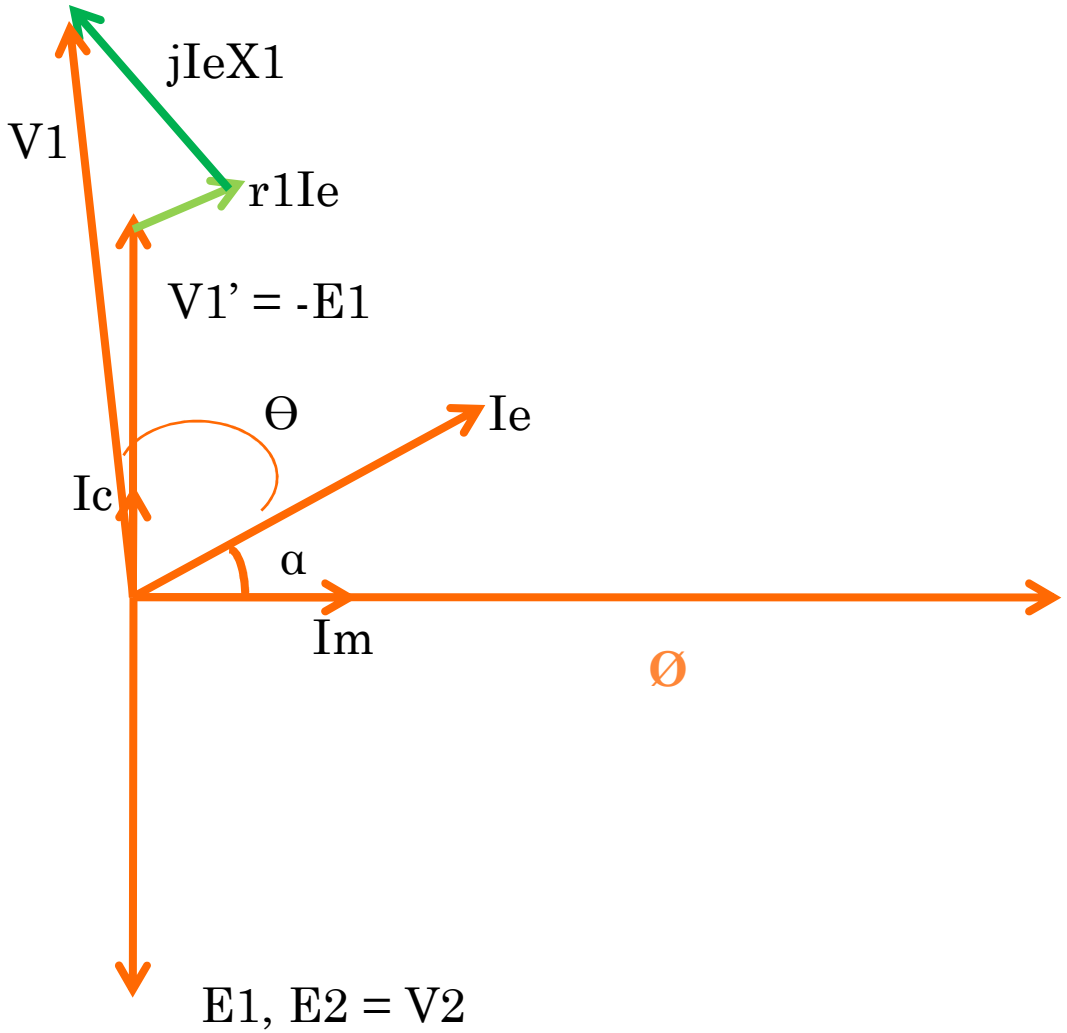
NO LOAD PHASOR OF A TRANSFORMER

Sourec Voltage V1 = V1'+r1Ie +jIeX1, phasor sum.

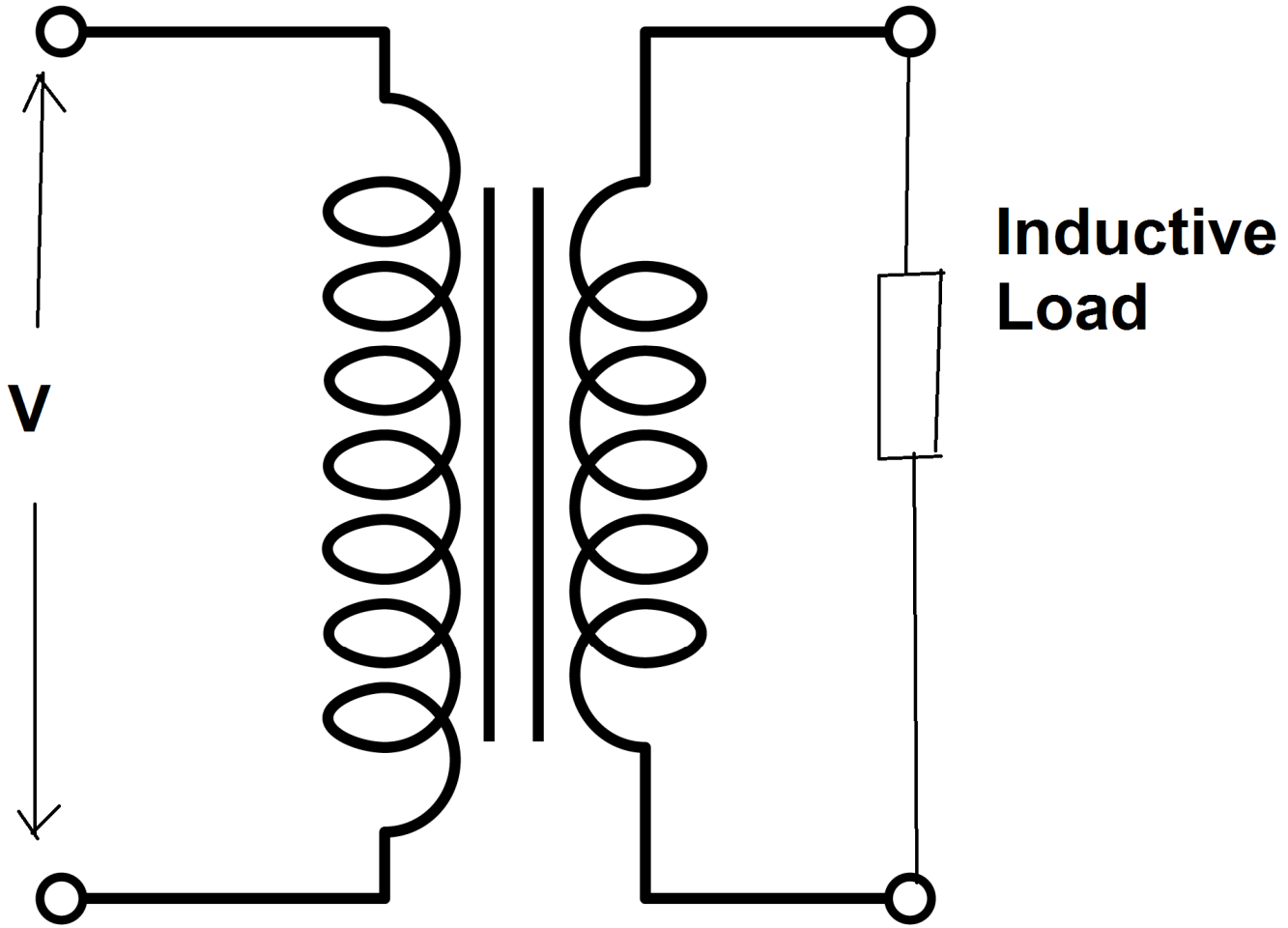


NO LOAD PHASOR OF A TRANSFORMER

No load Power Factor = CosΘ



PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD



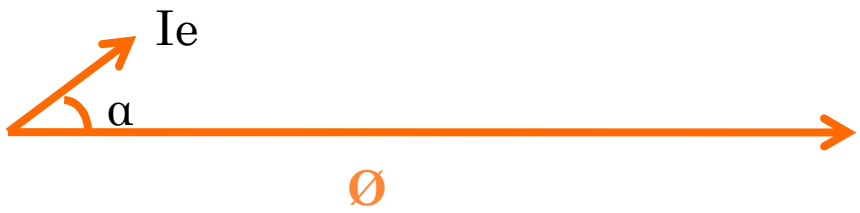
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- As load is inductive, secondary current will lag secondary load voltage V2 by some angle.
- r1 = Primary winding Resistance
- X1 = Primary winding leakage Reactance
- r2 = Secondary winding Resistance
- X2 = Secondary winding leakage Reactance

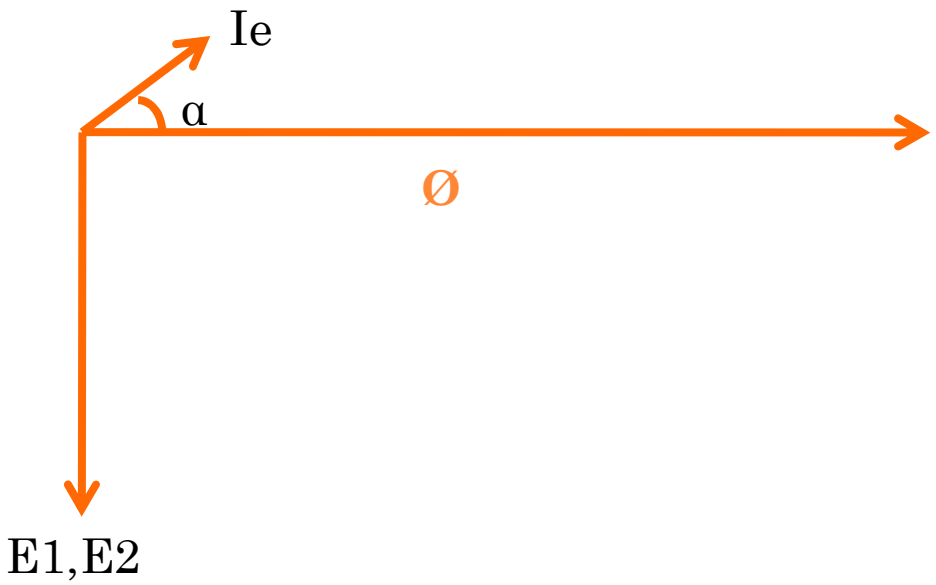
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.

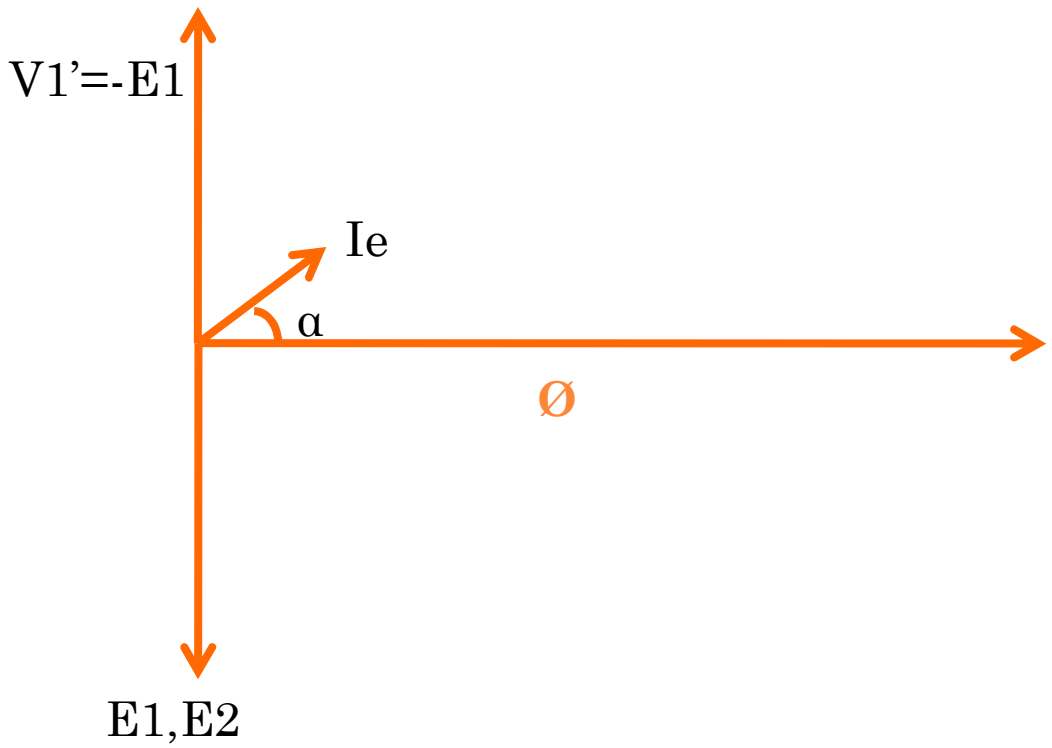
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD



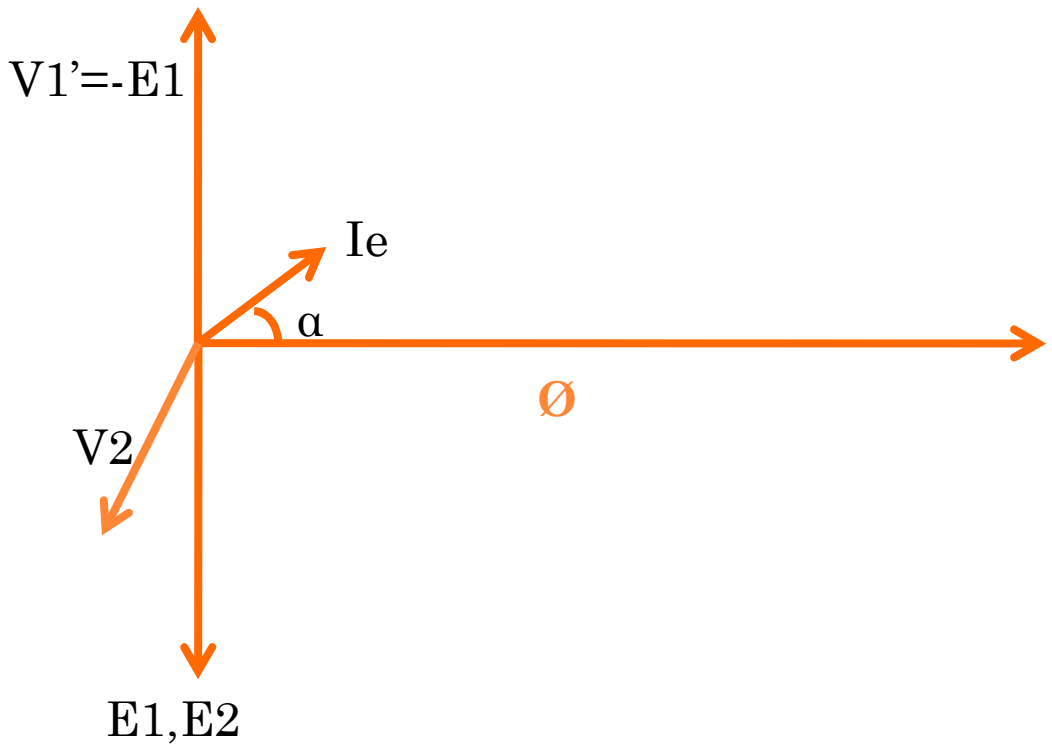
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD



PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

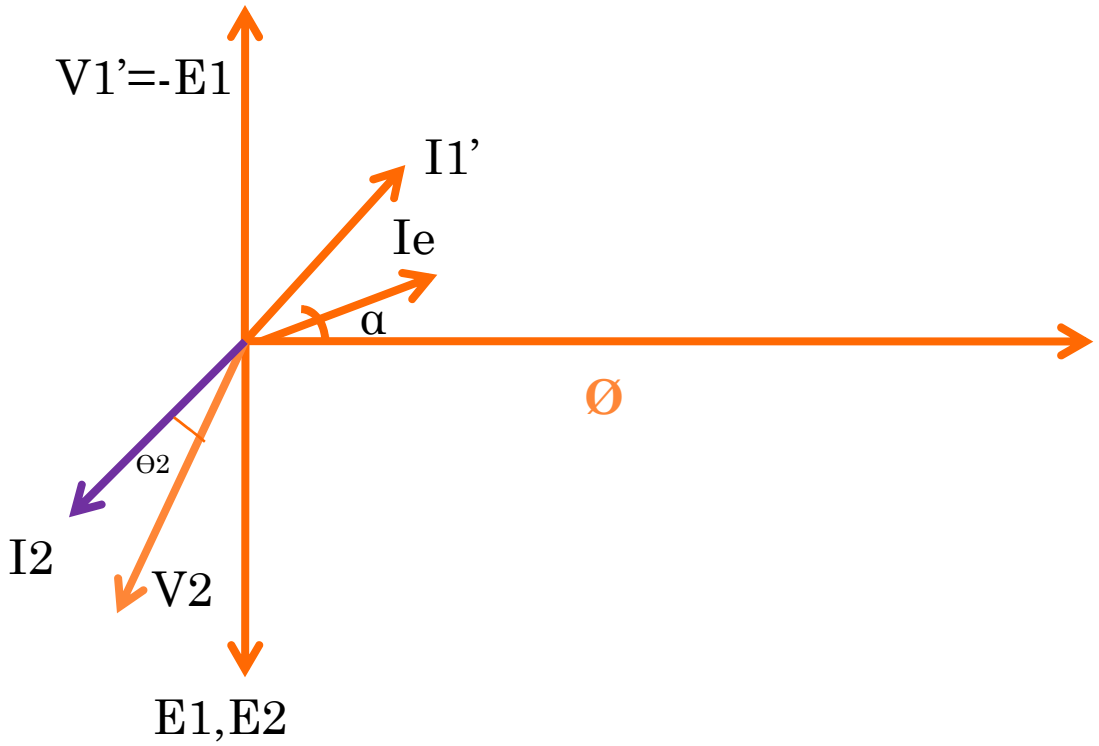


PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD



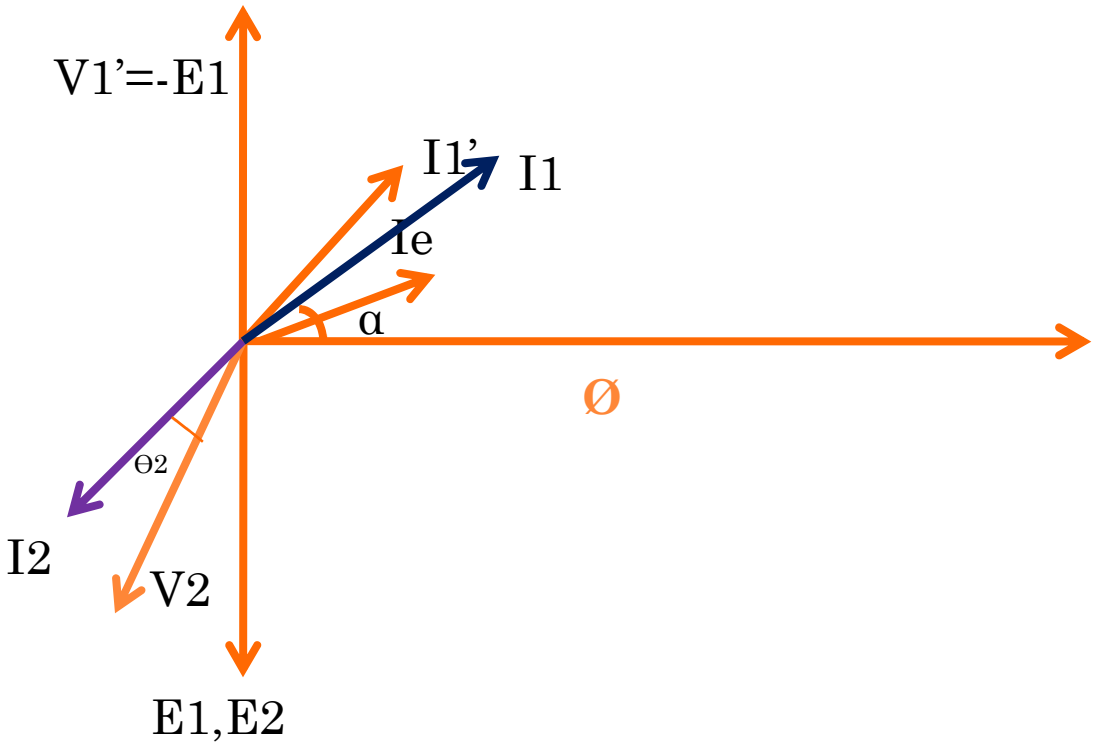
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



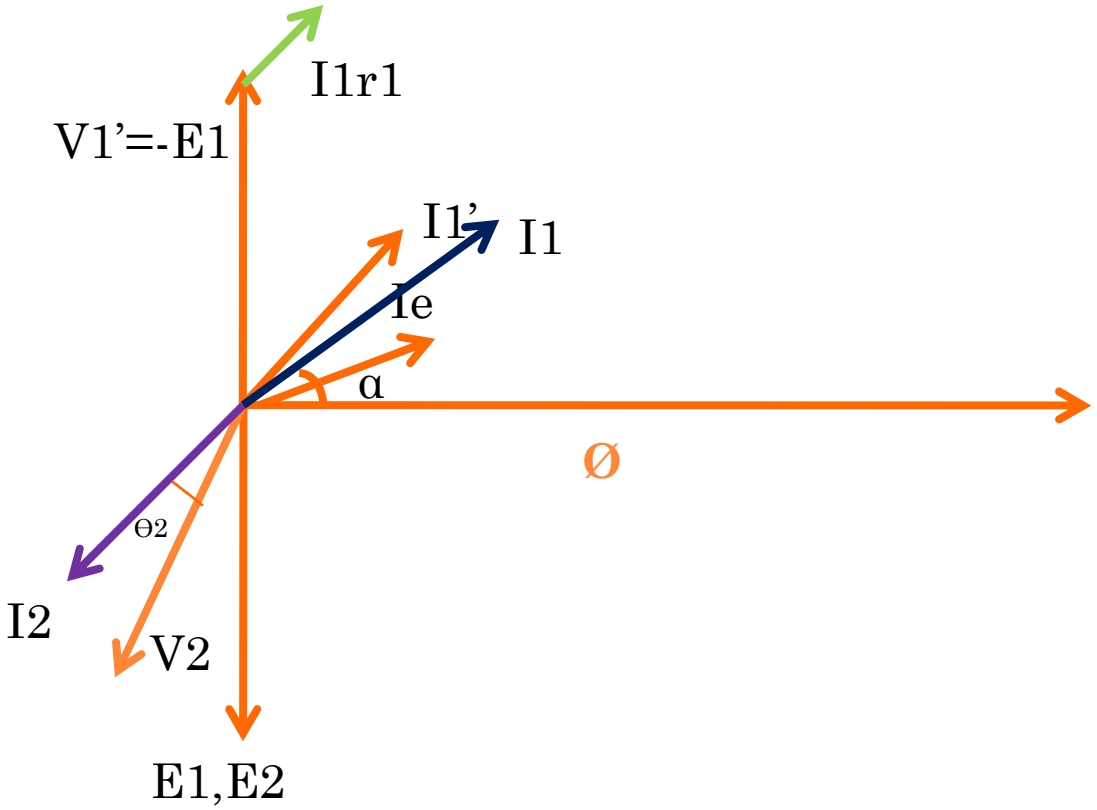
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



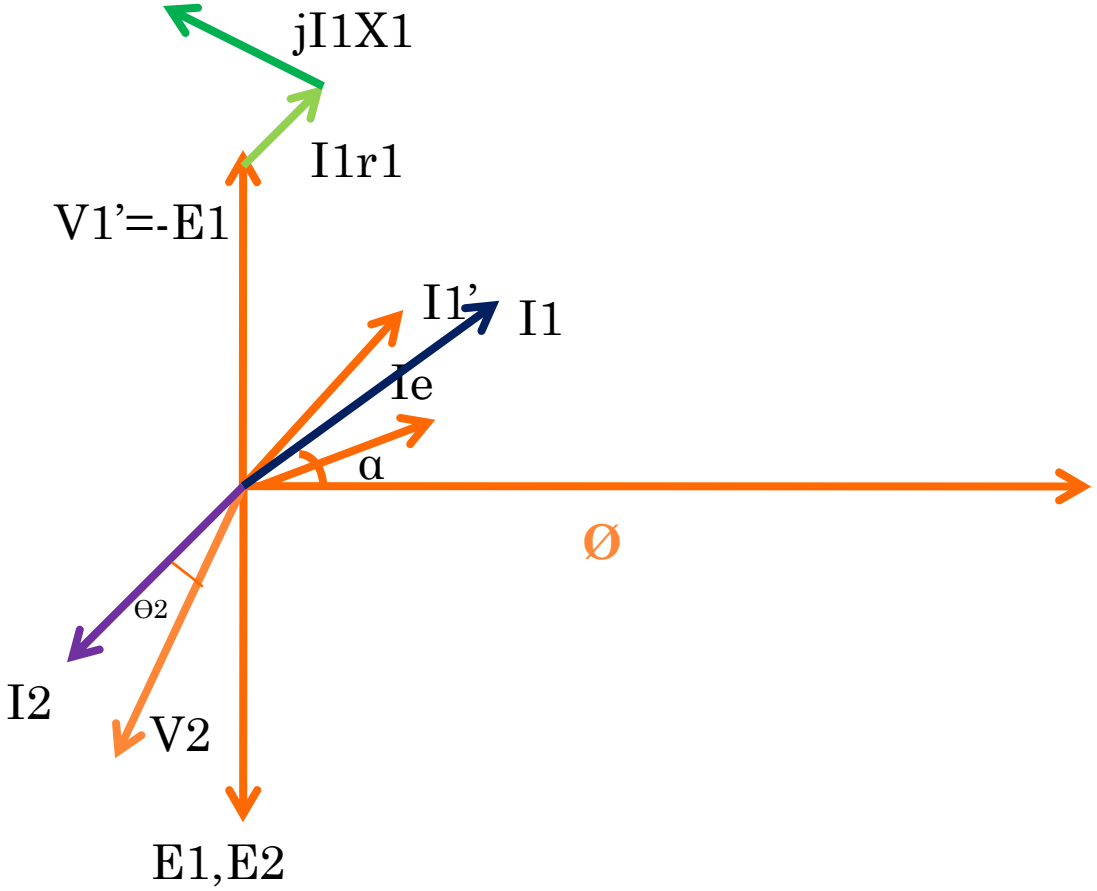
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



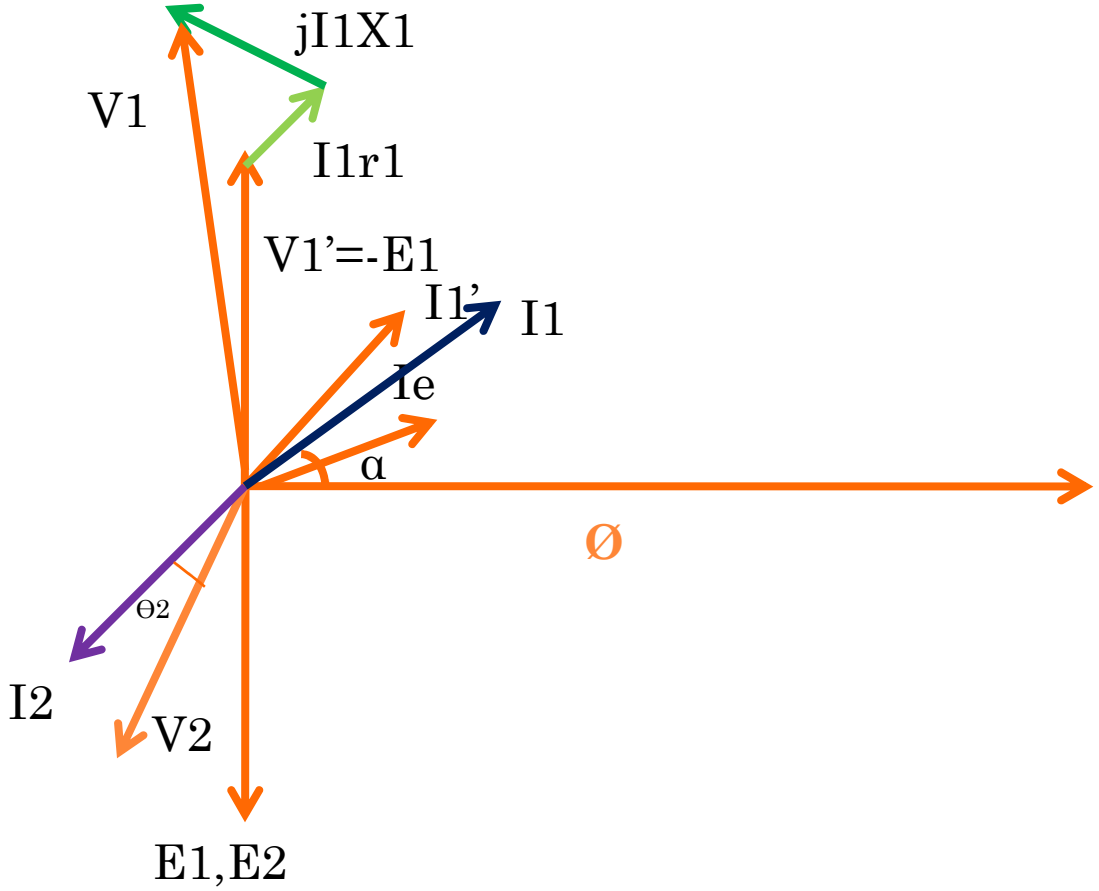
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



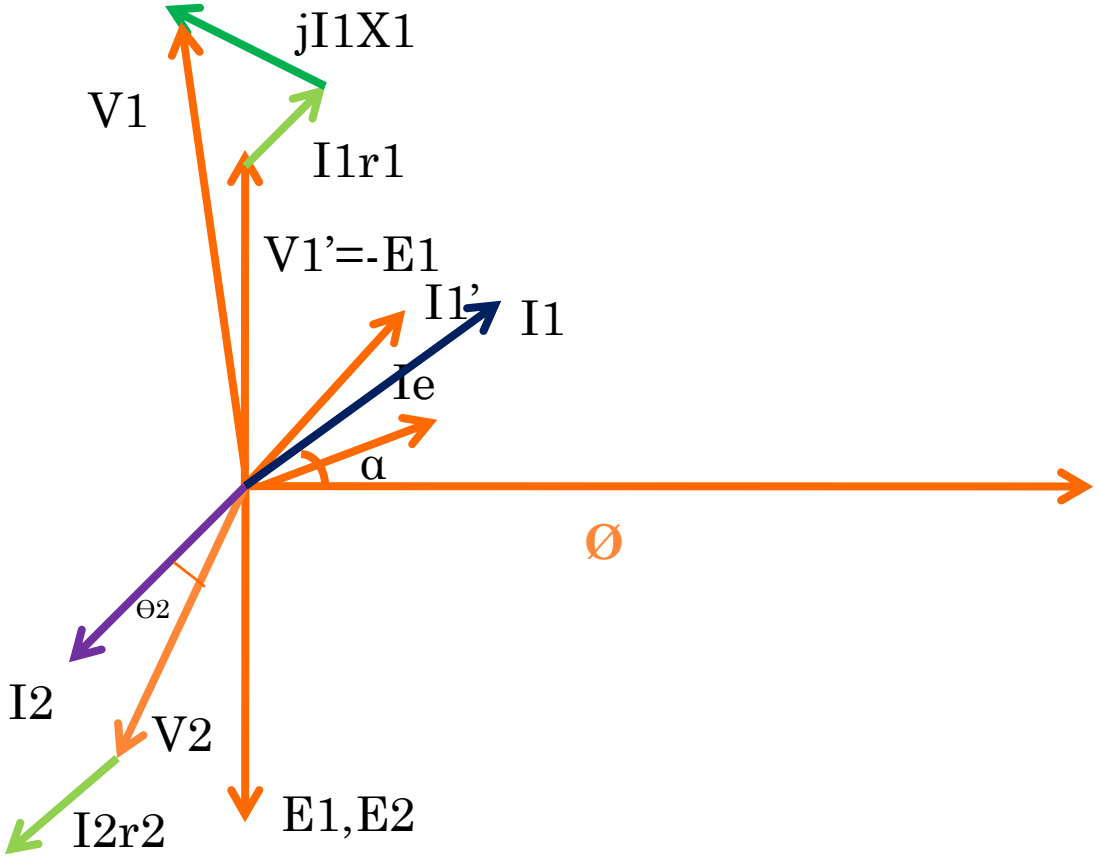
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



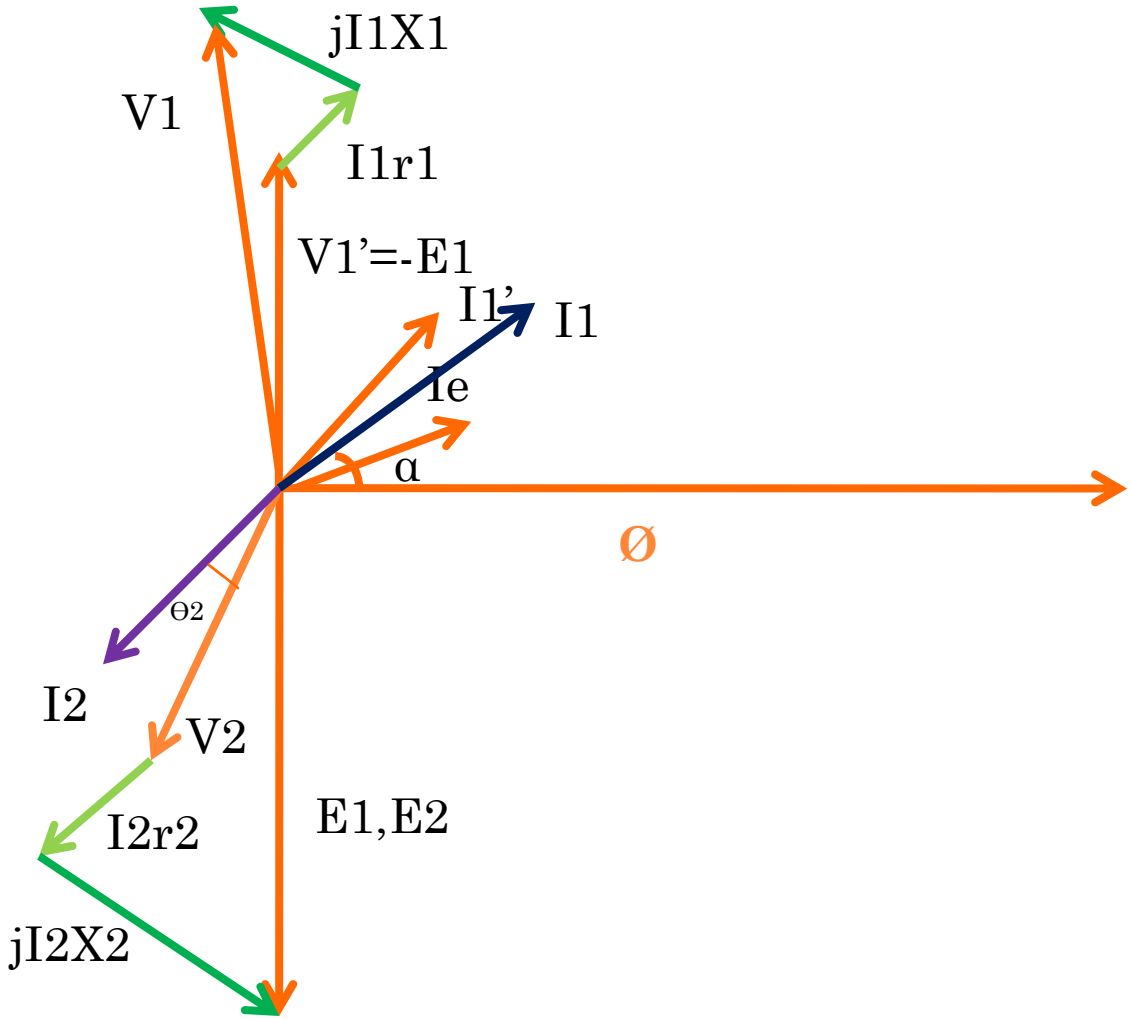
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Working Flux Ø is taken as referance.



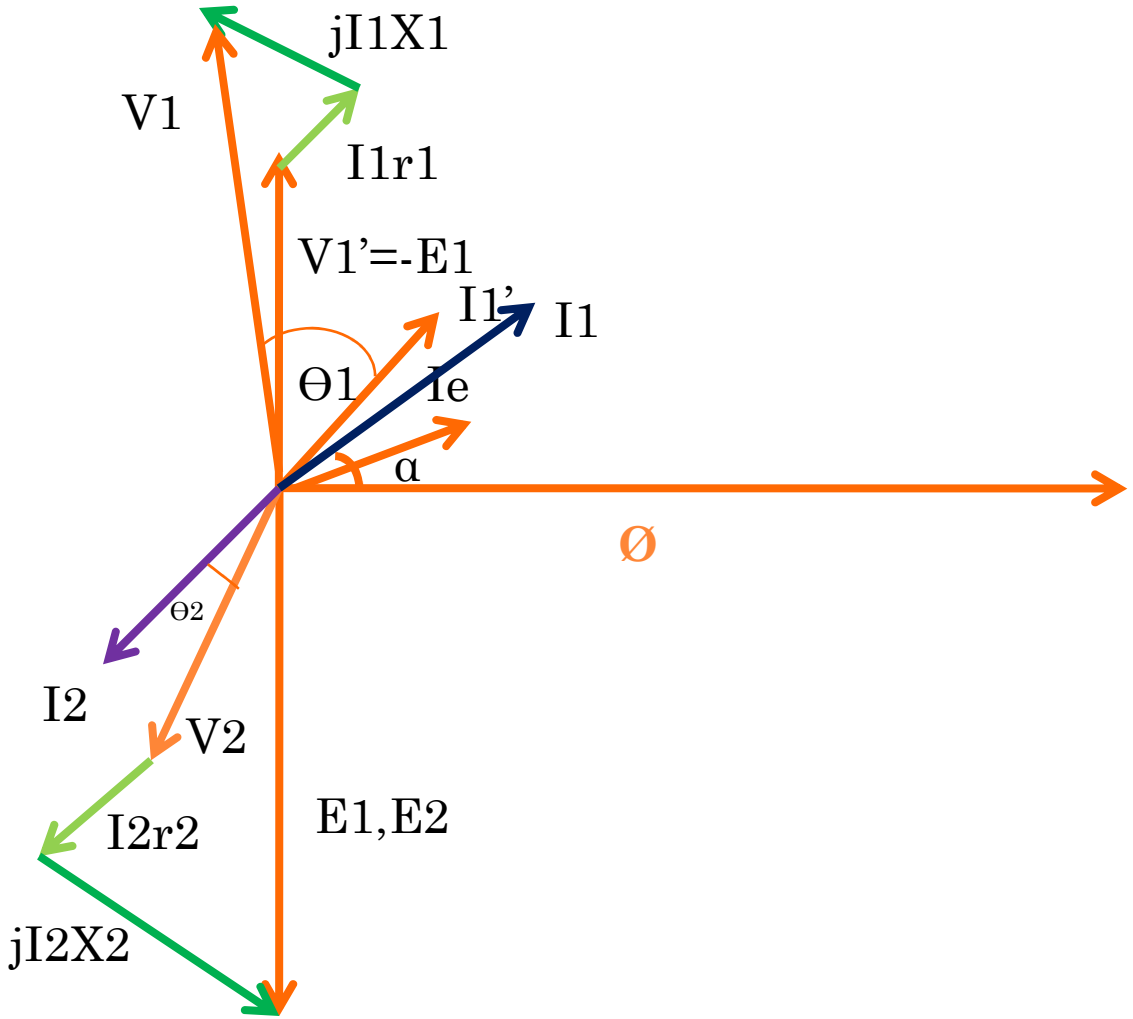
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- E2 = V2+I2r2+jI2X2, phasor sum



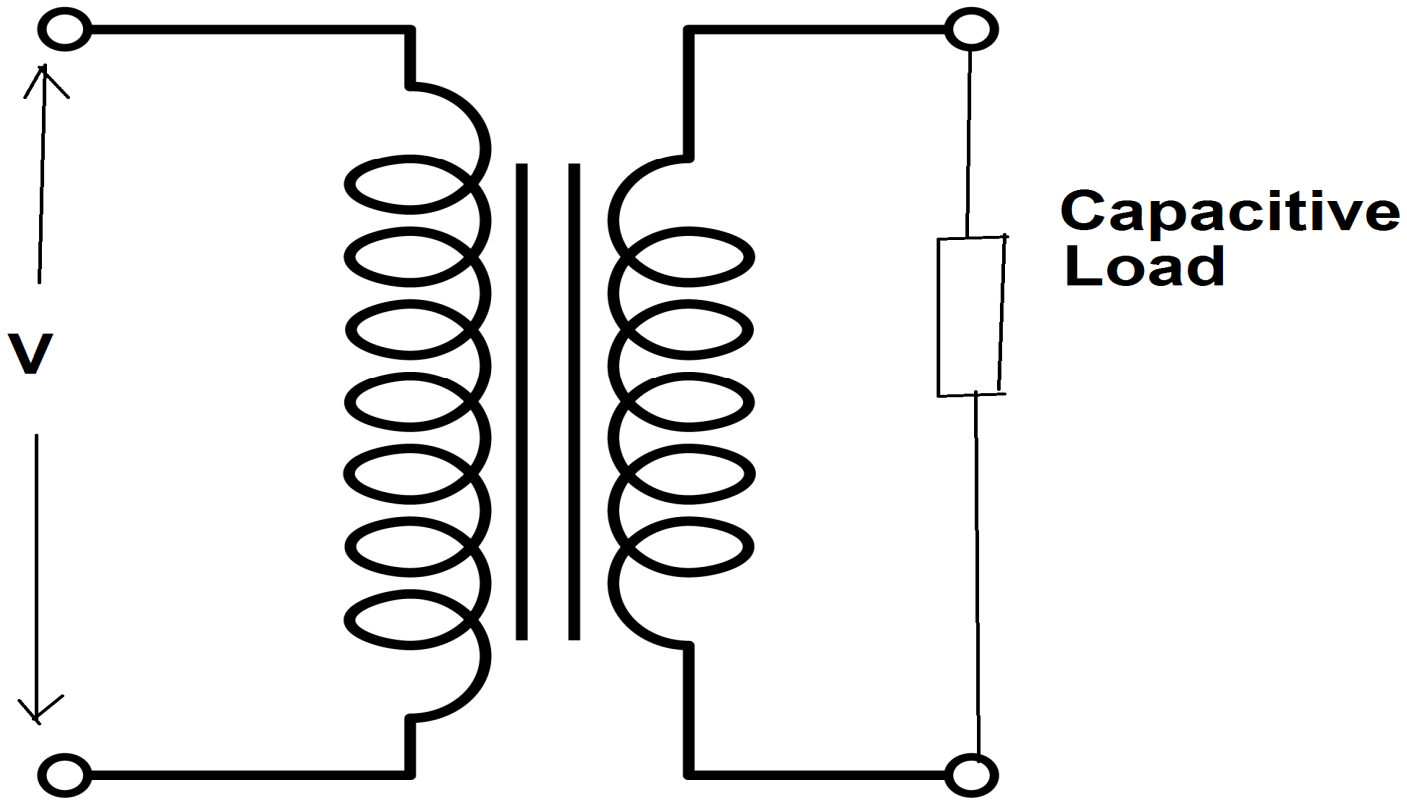
PHASOR OF A TRANSFORMER FOR INDUCTIVE LOAD

- Primary Power Factor= Cos Θ1, angle between V1 & I1.



PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD

- As load is capacitive, secondary current will lead secondary load voltage V2 by some angle.

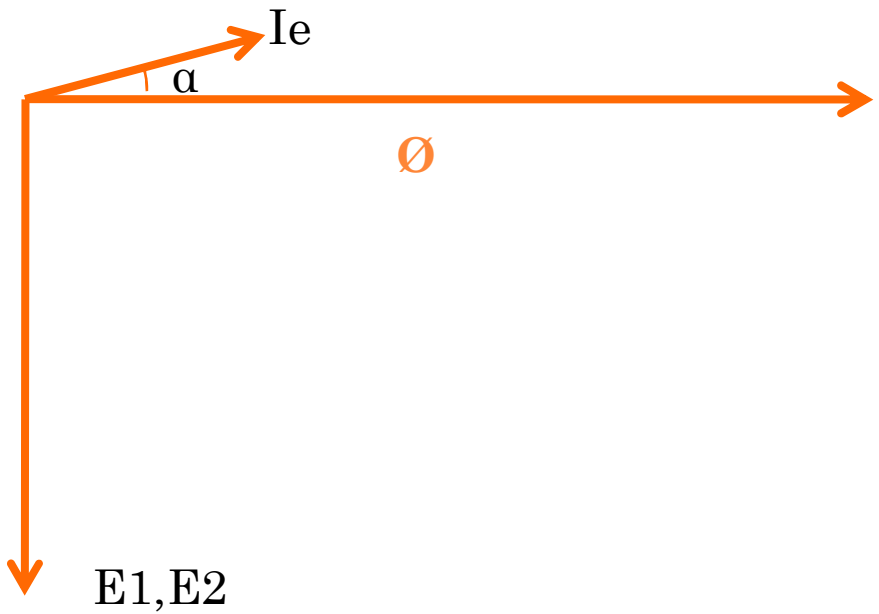


PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD

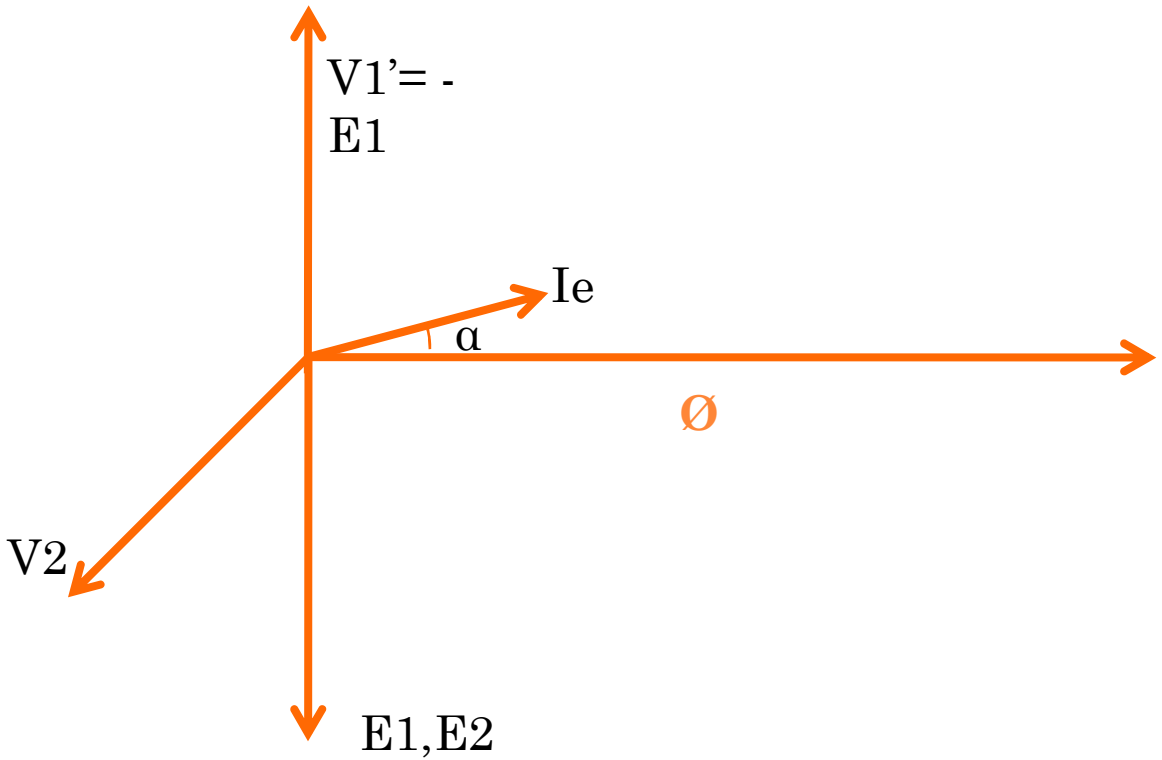
- Working Flux Ø is taken as reference.

PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD

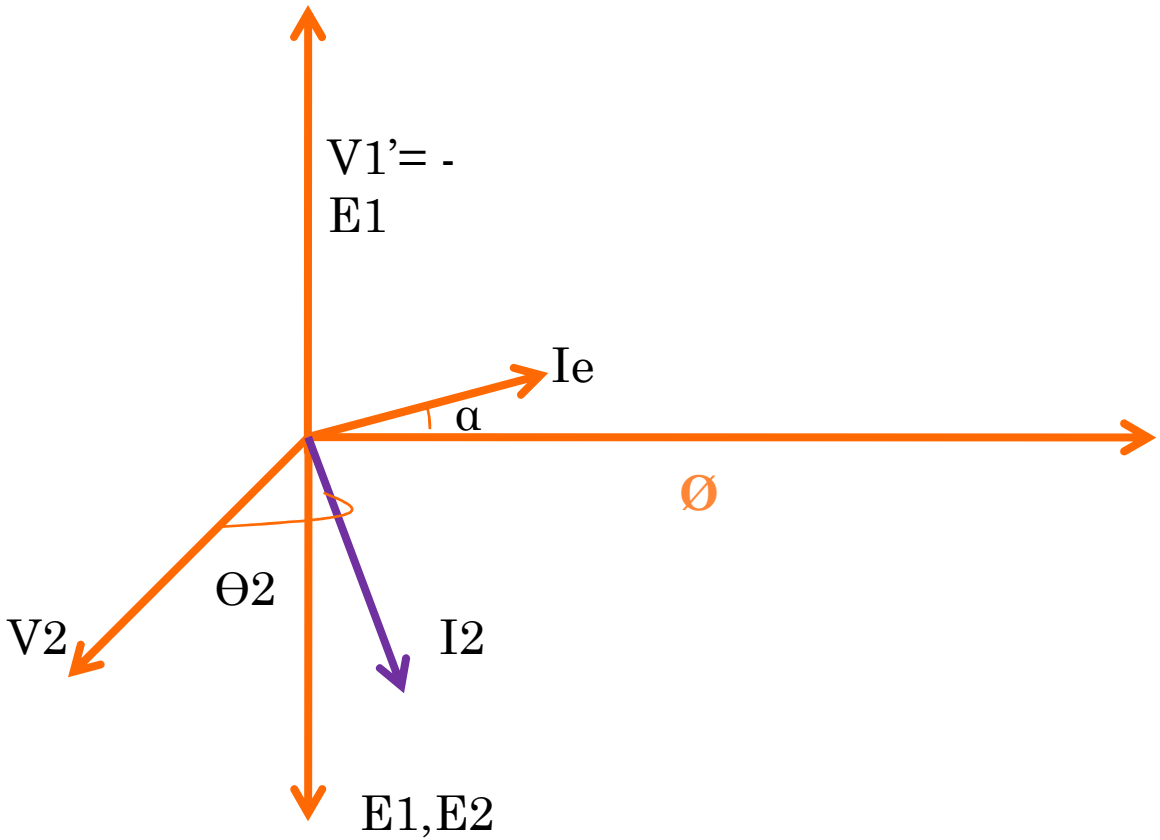
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



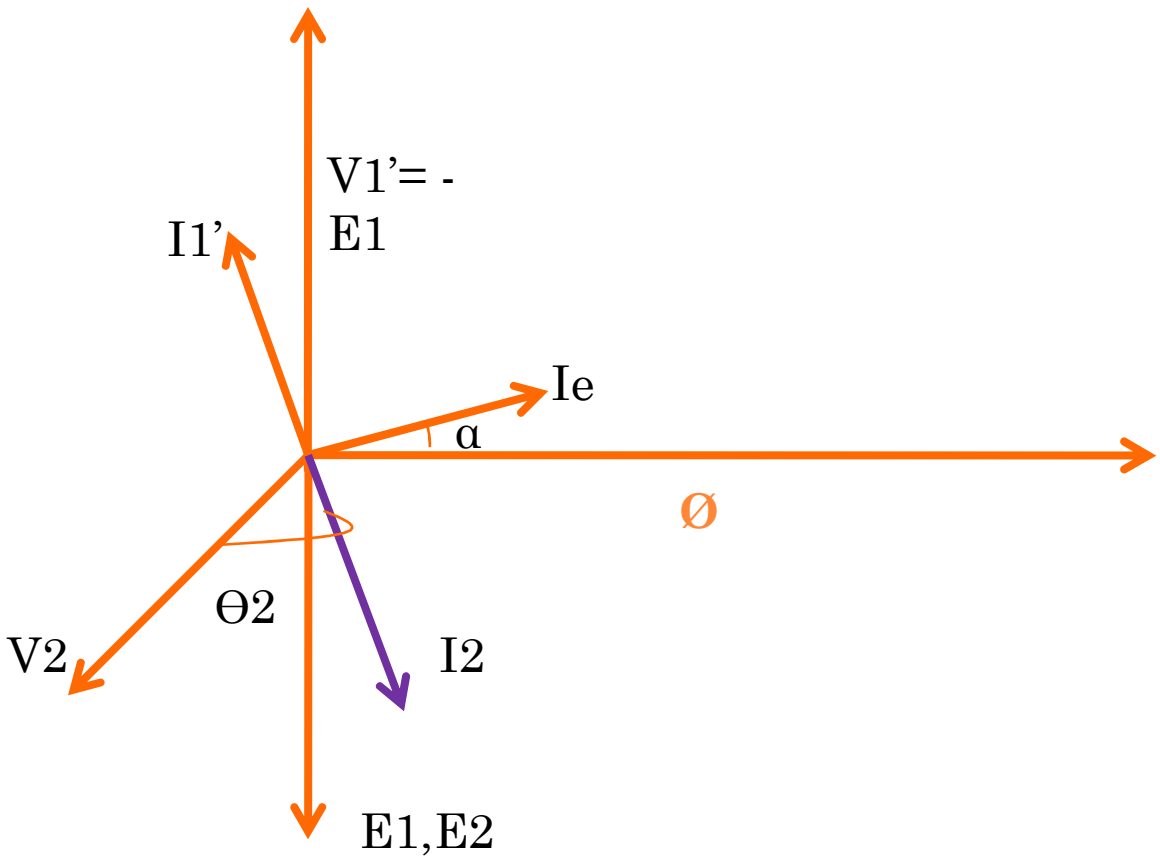
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



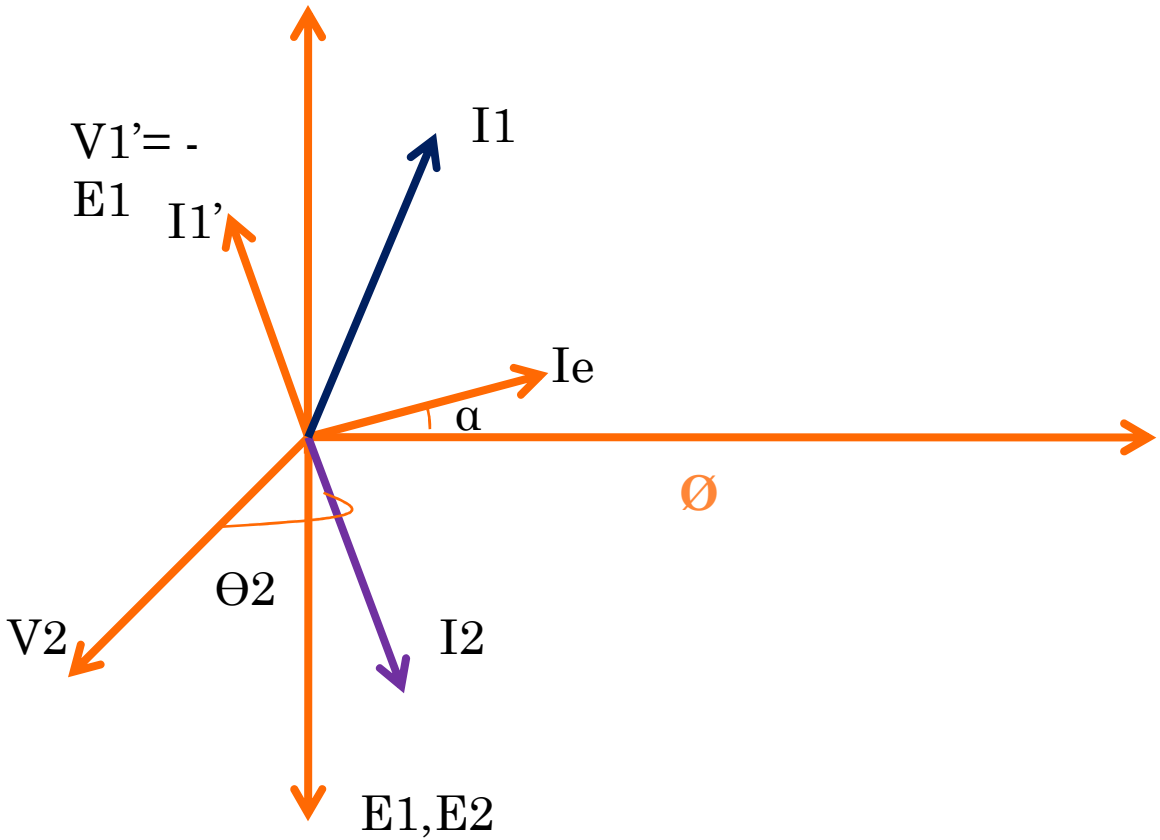
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



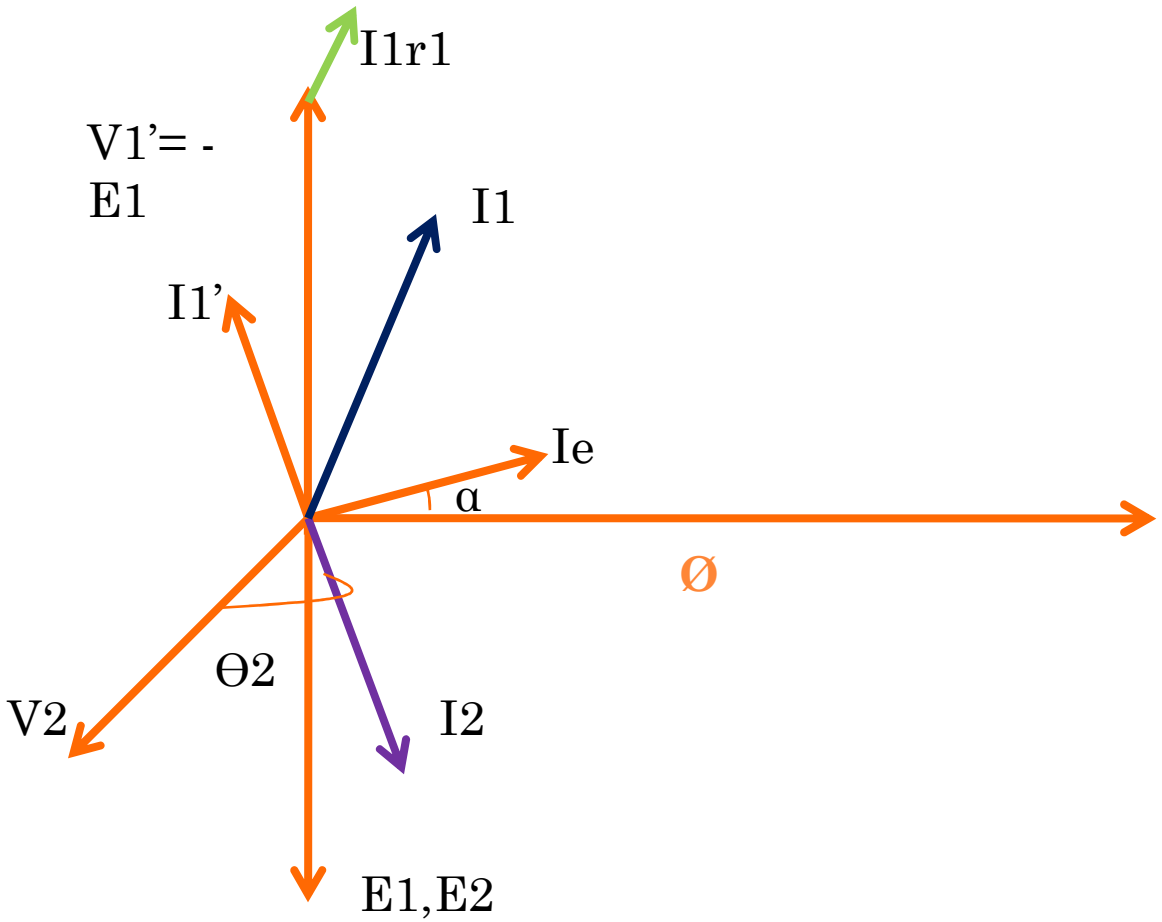
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



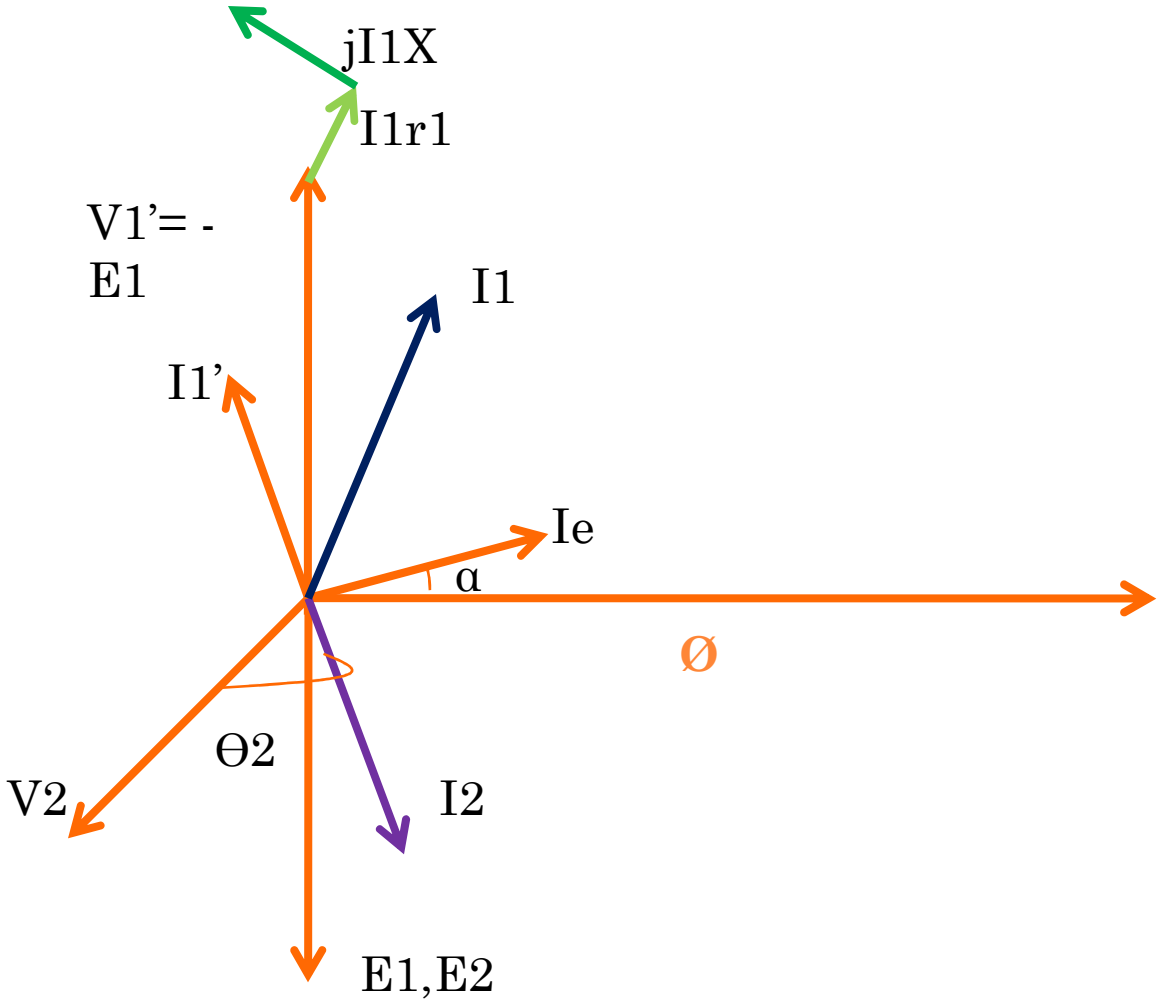
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



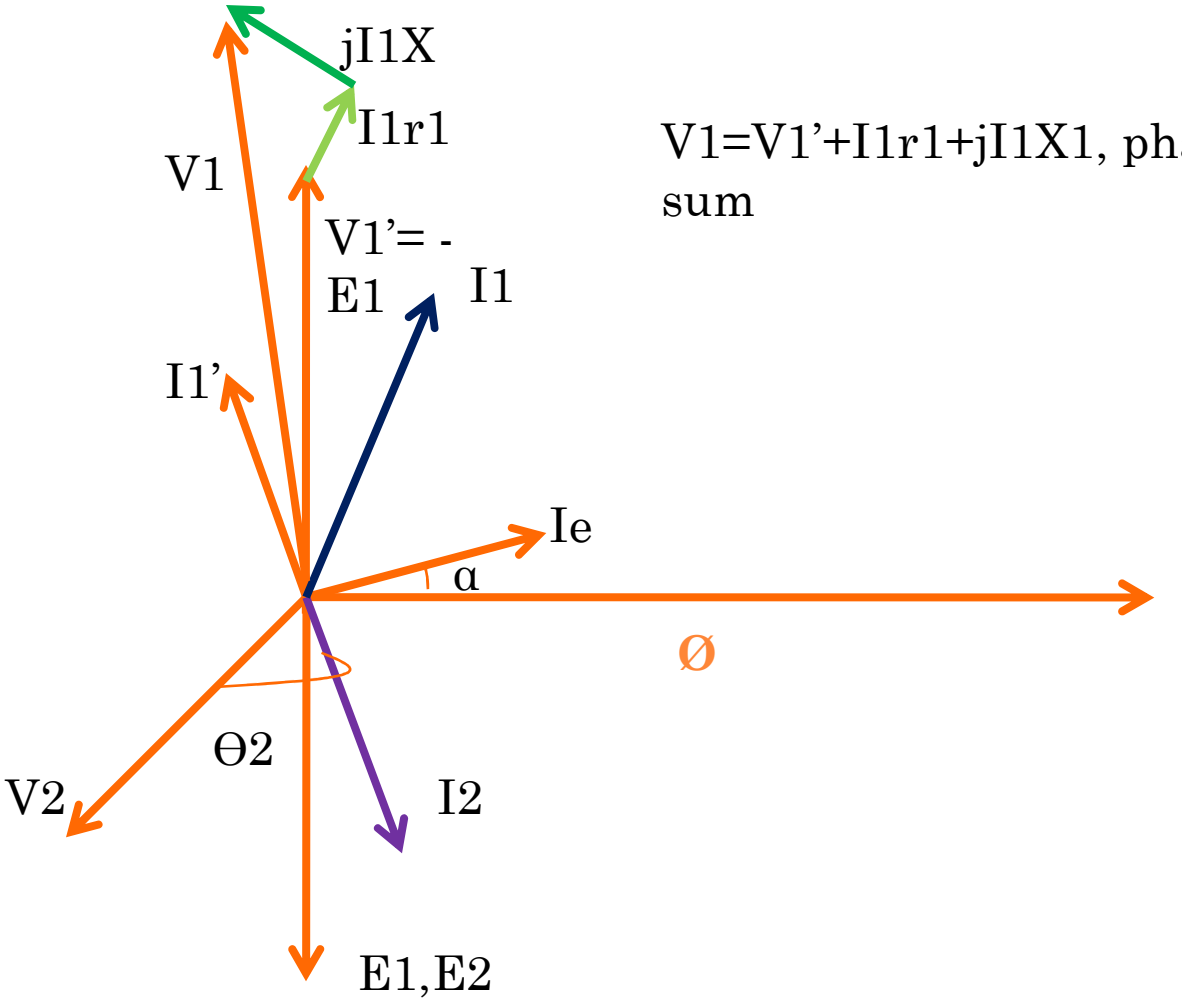
PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD

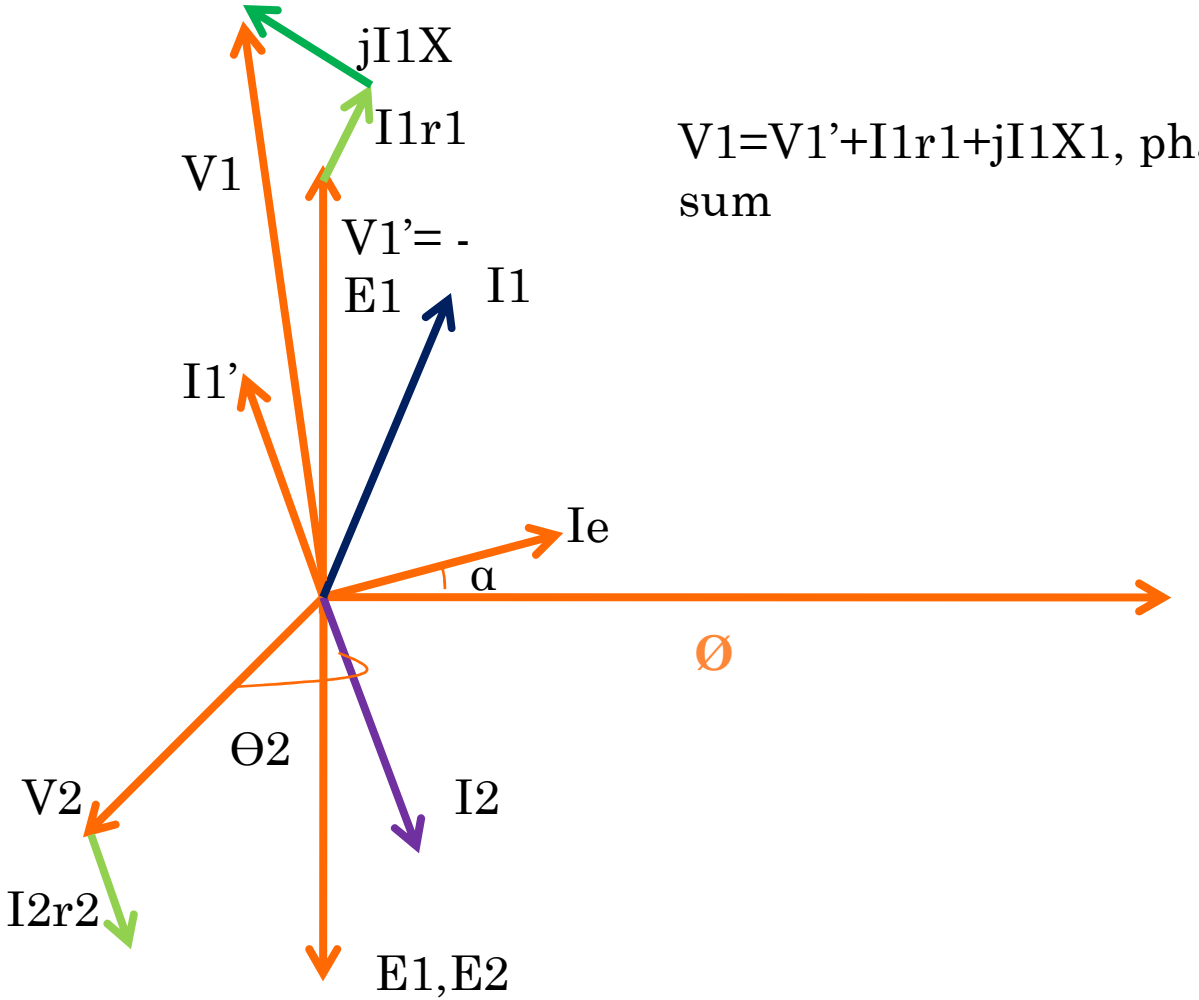


PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



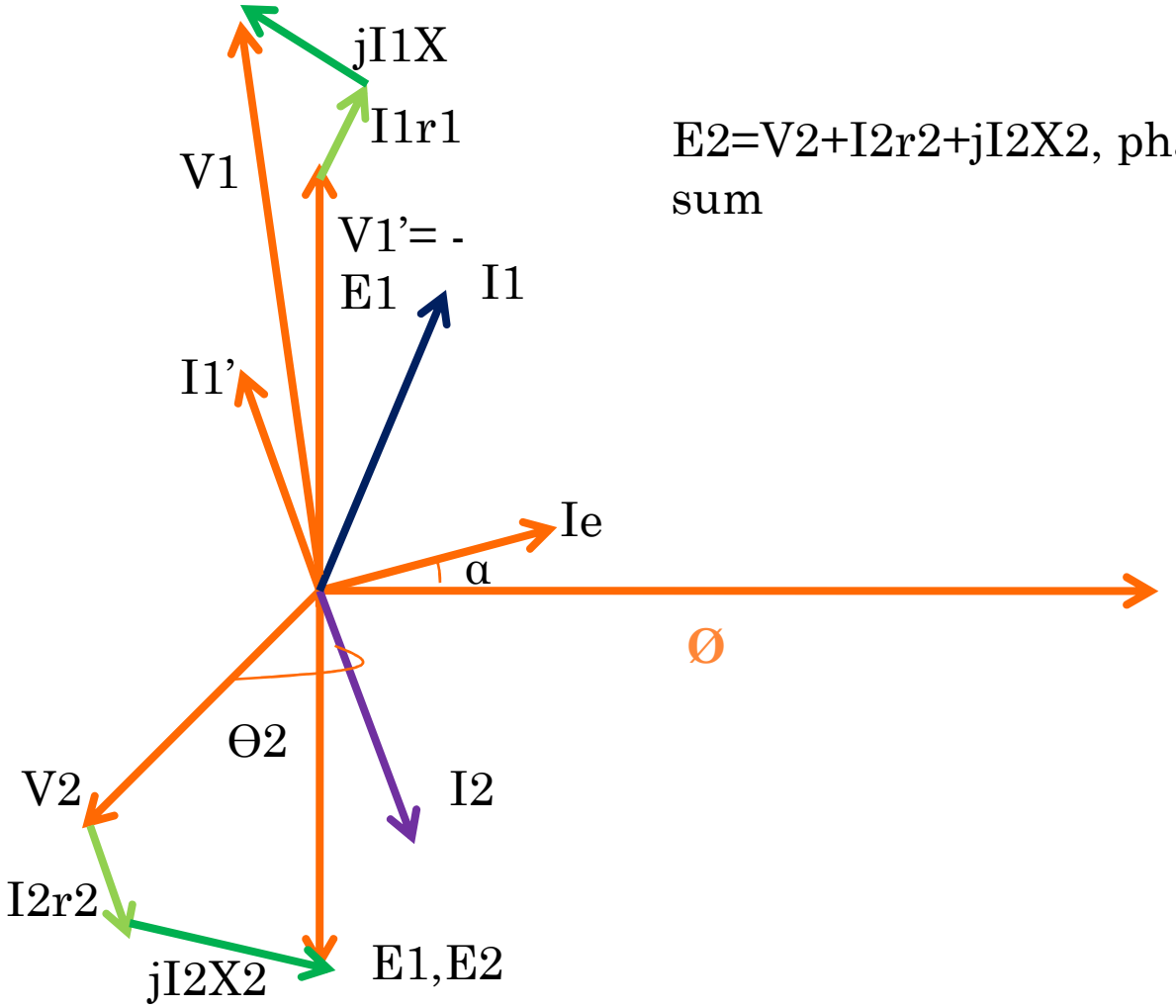
V1=V1'+I1r1+jI1X1, phasor sum

PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



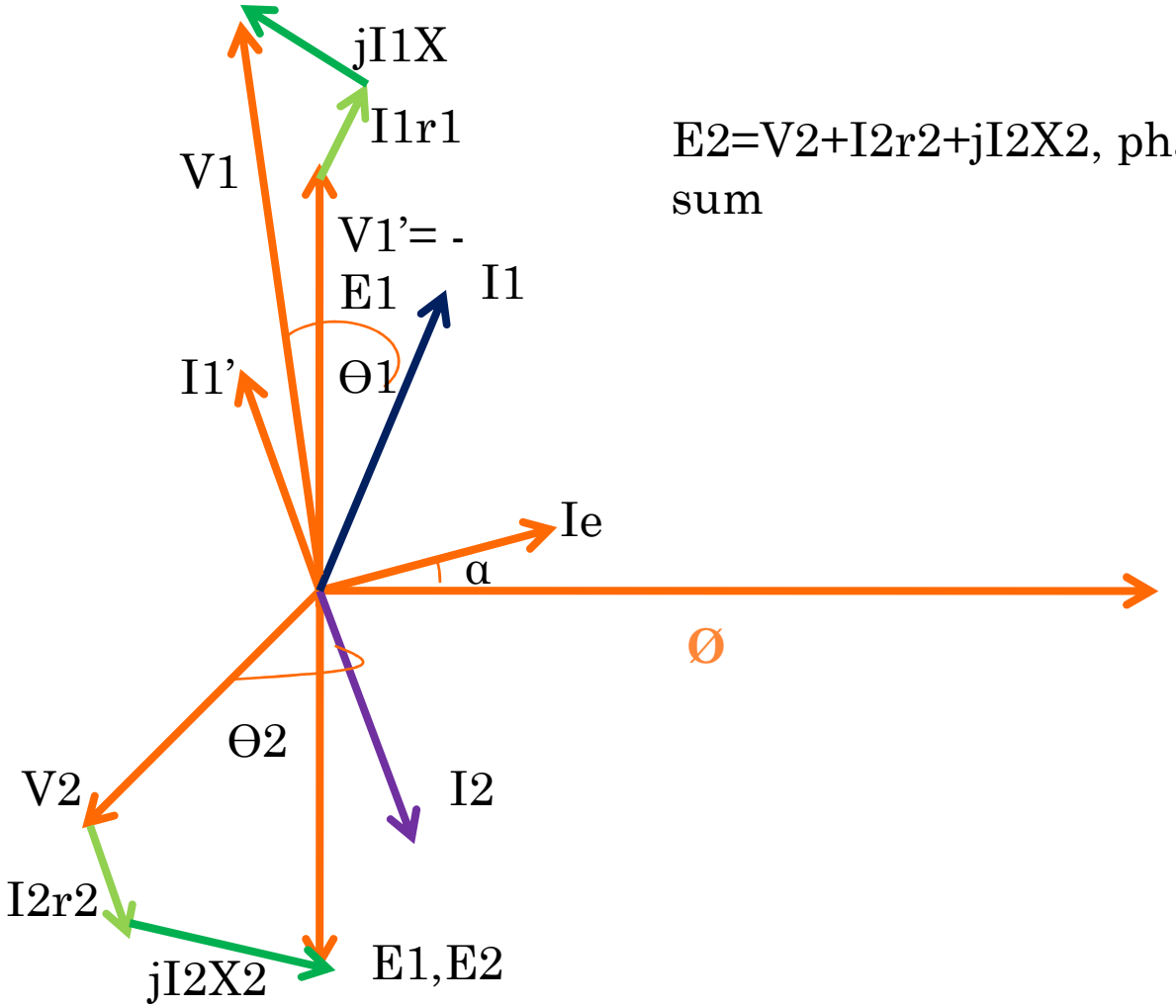
V1=V1'+I1r1+jI1X1, phasor sum

PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



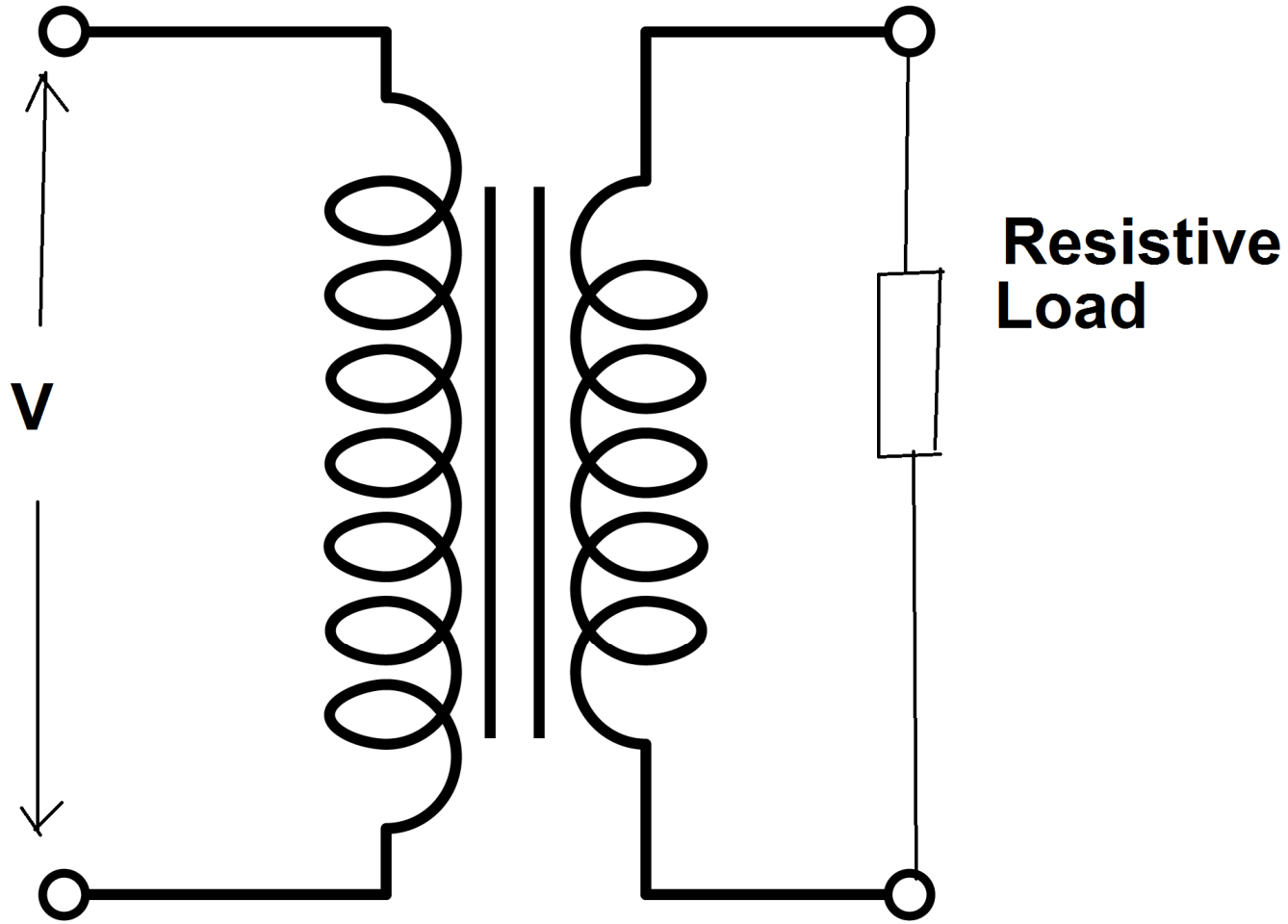
E2=V2+I2r2+jI2X2, phasor sum

PHASOR OF A TRANSFORMER FOR CAPACITIVE LOAD



E2=V2+I2r2+jI2X2, phasor sum

PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



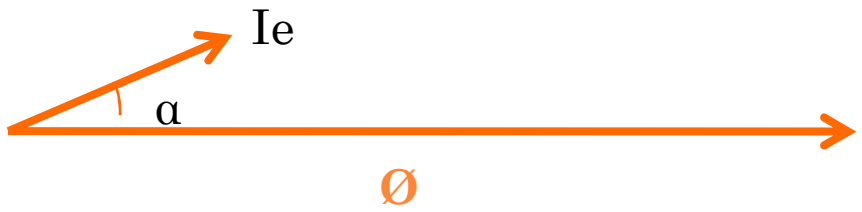
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD

- For Resistive Load, load current will be in phase with the load Voltage V2.

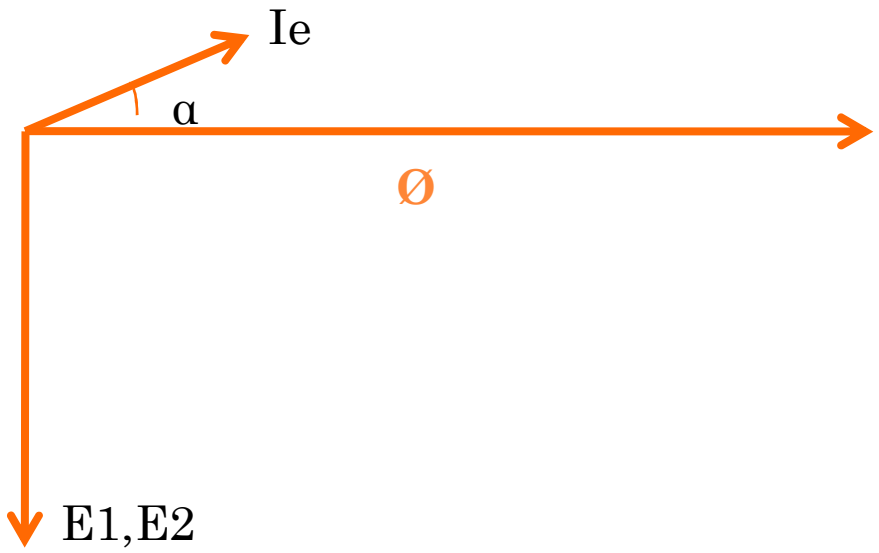
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD

- Working Flux Ø is taken as reference.

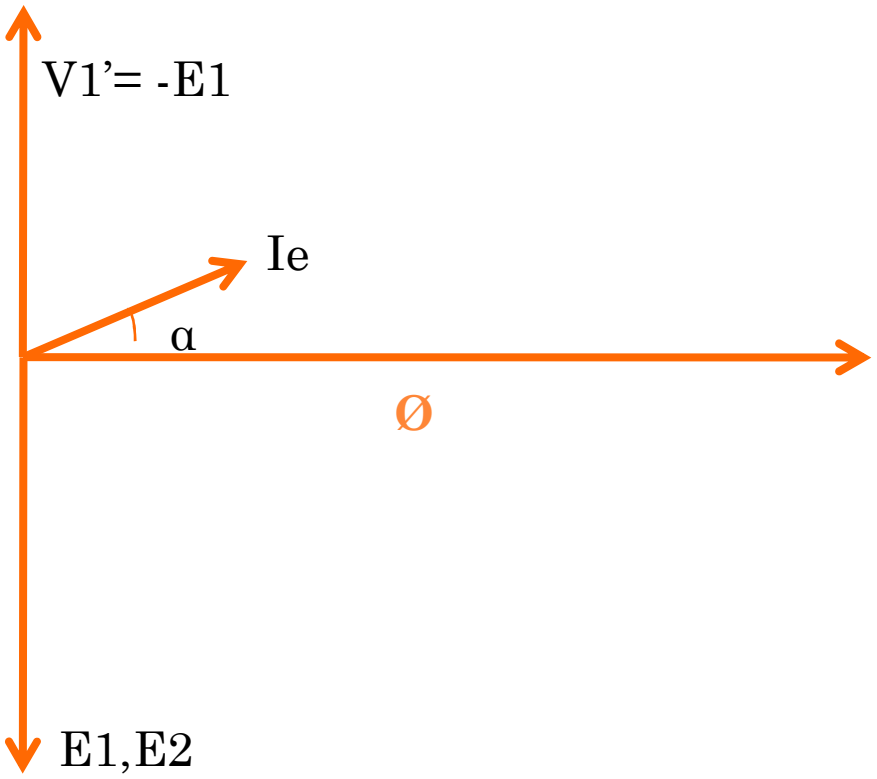
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



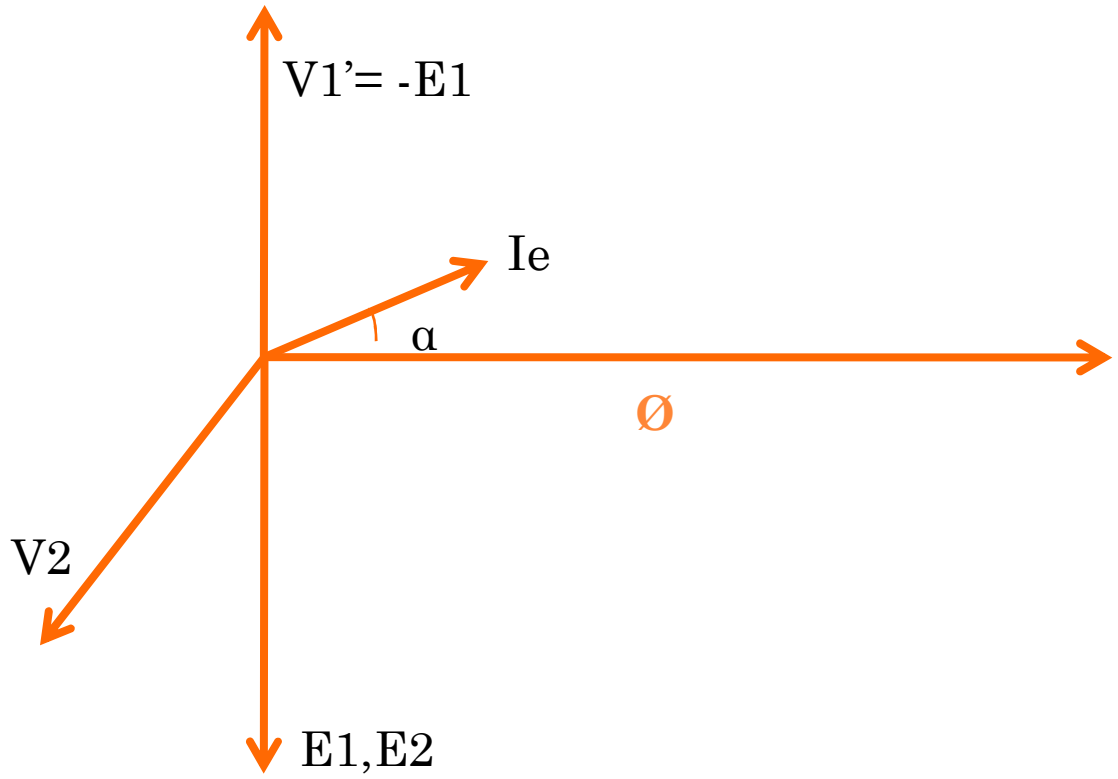
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



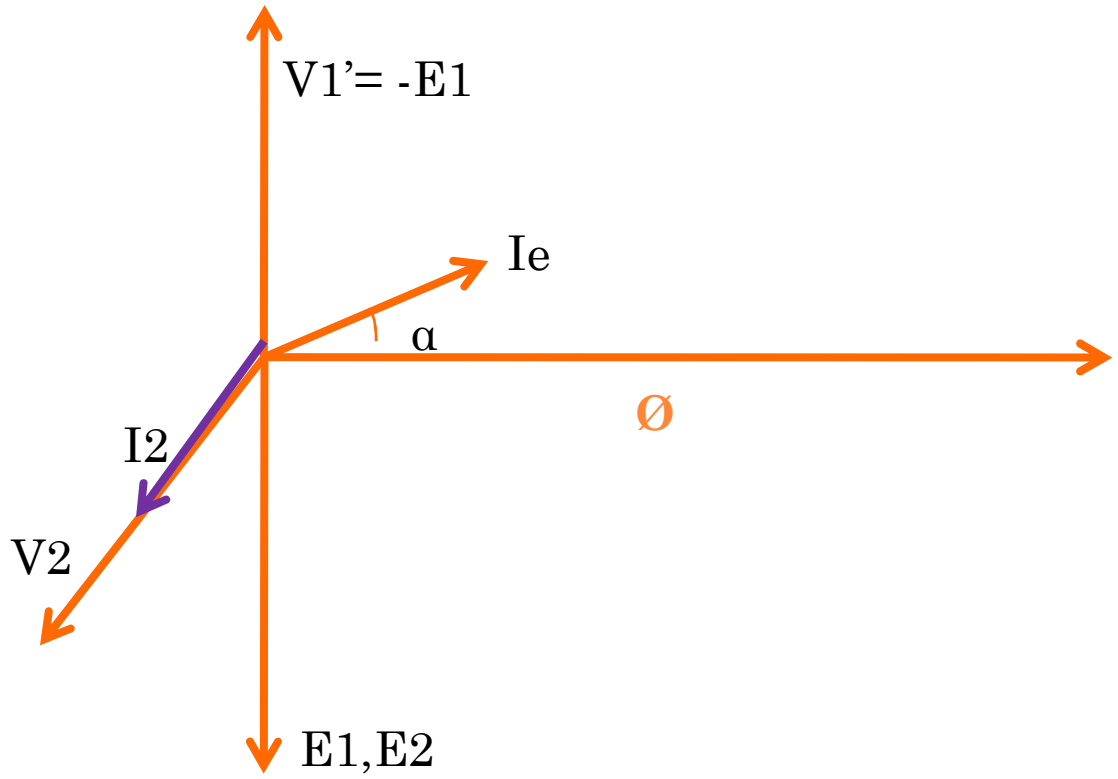
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



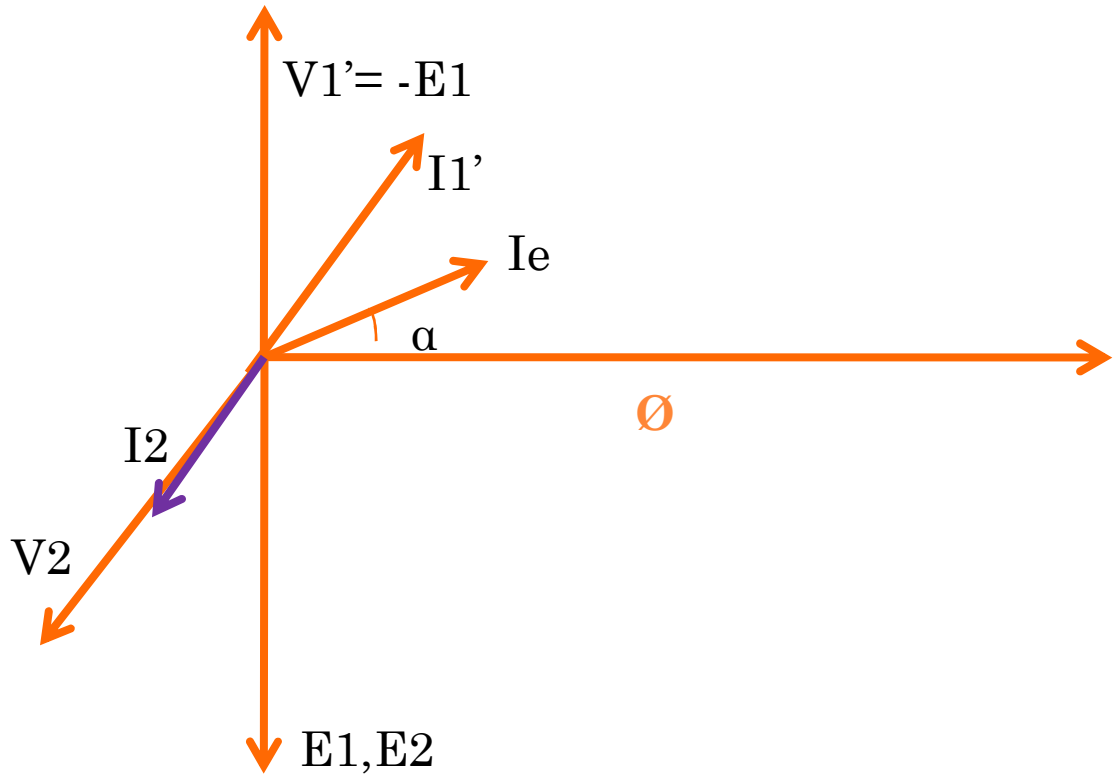
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



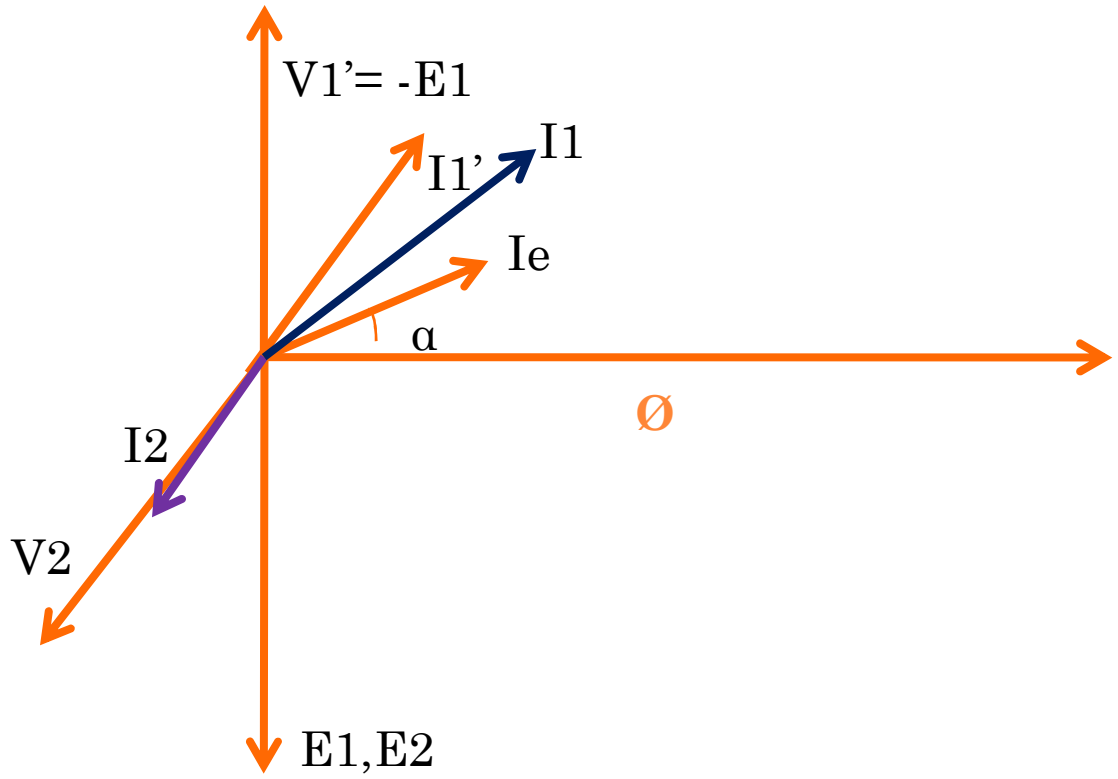
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



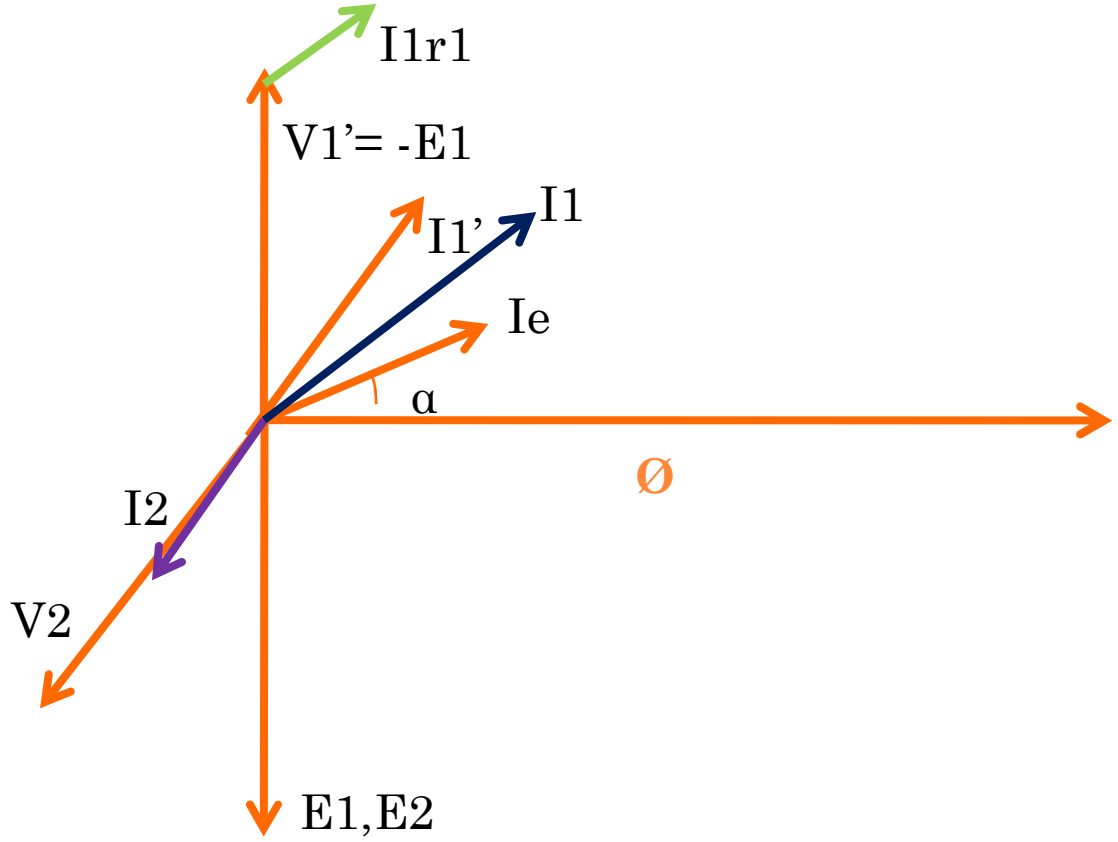
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



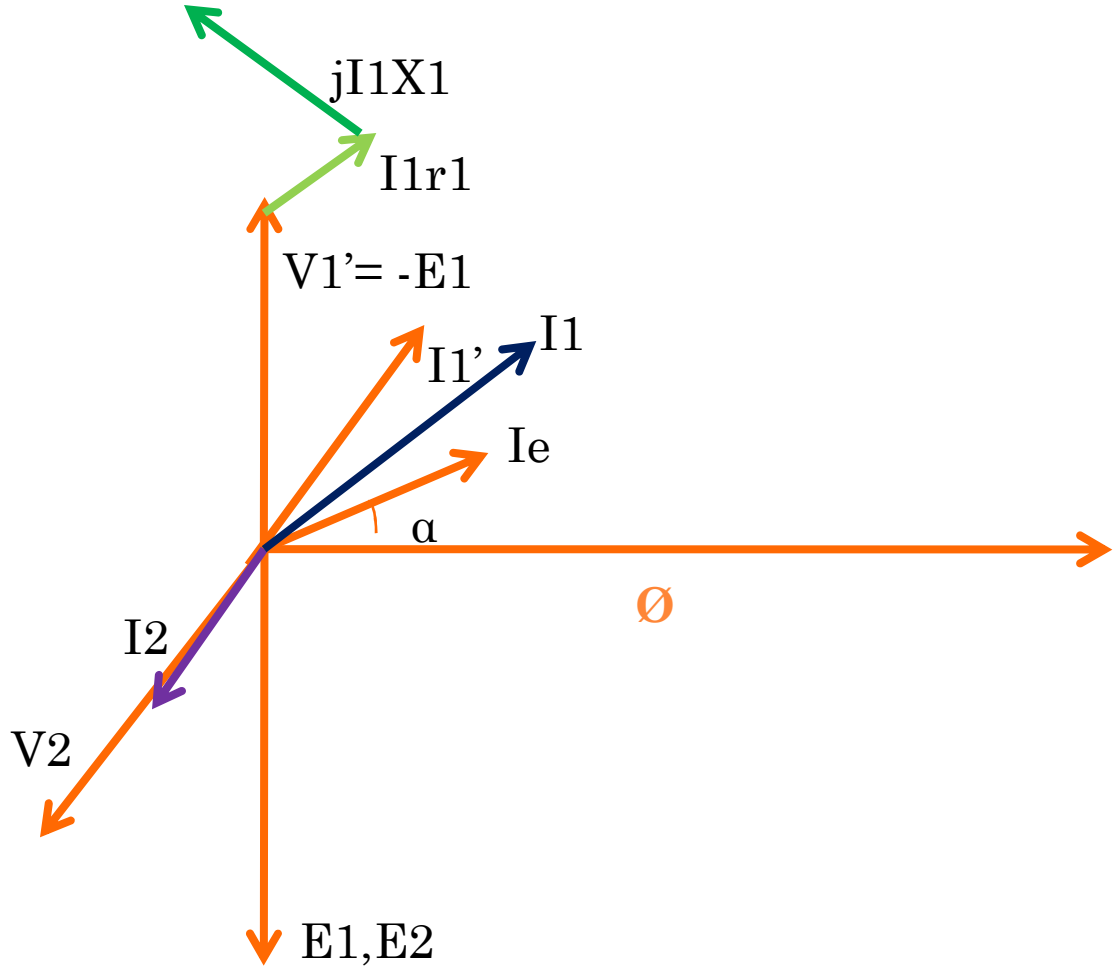
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



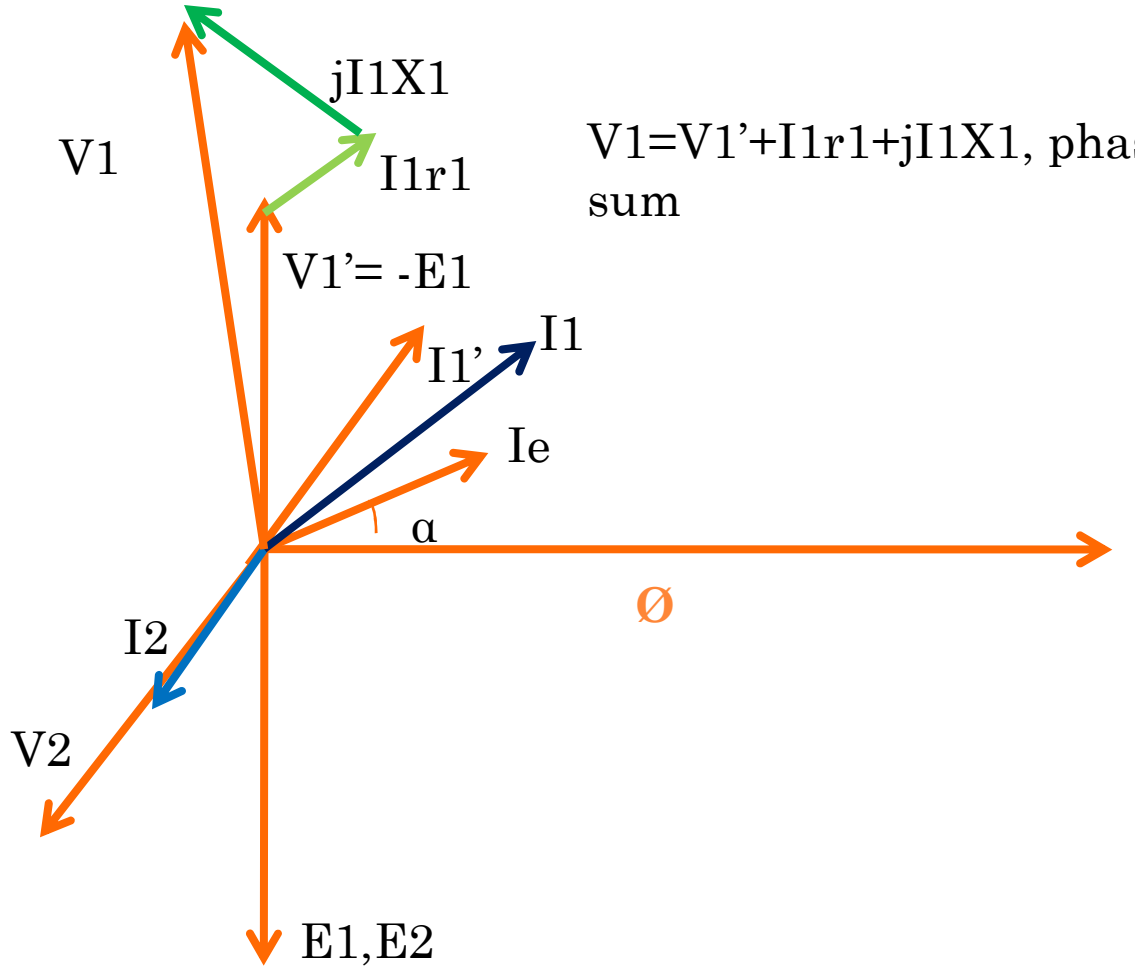
PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD

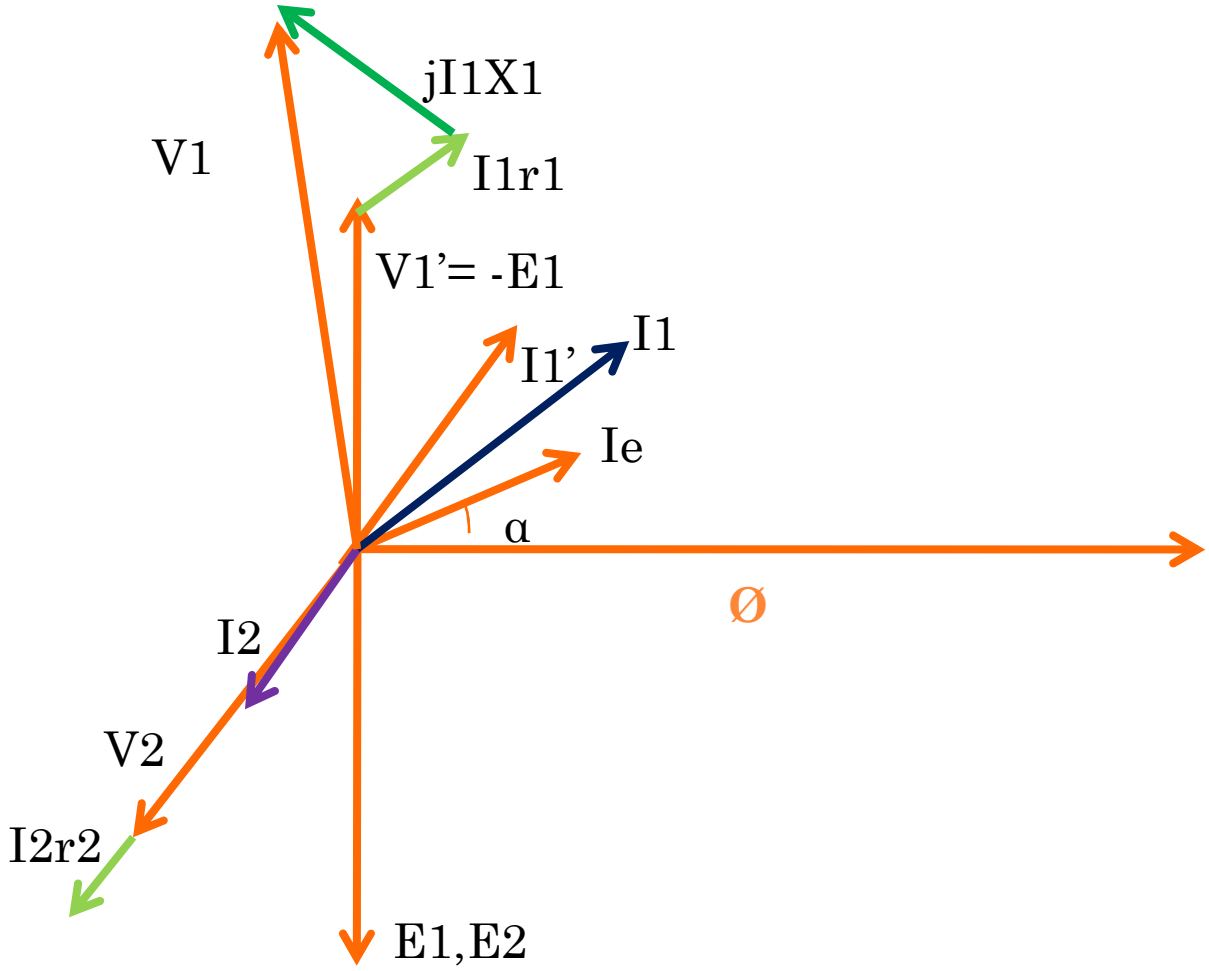


PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD

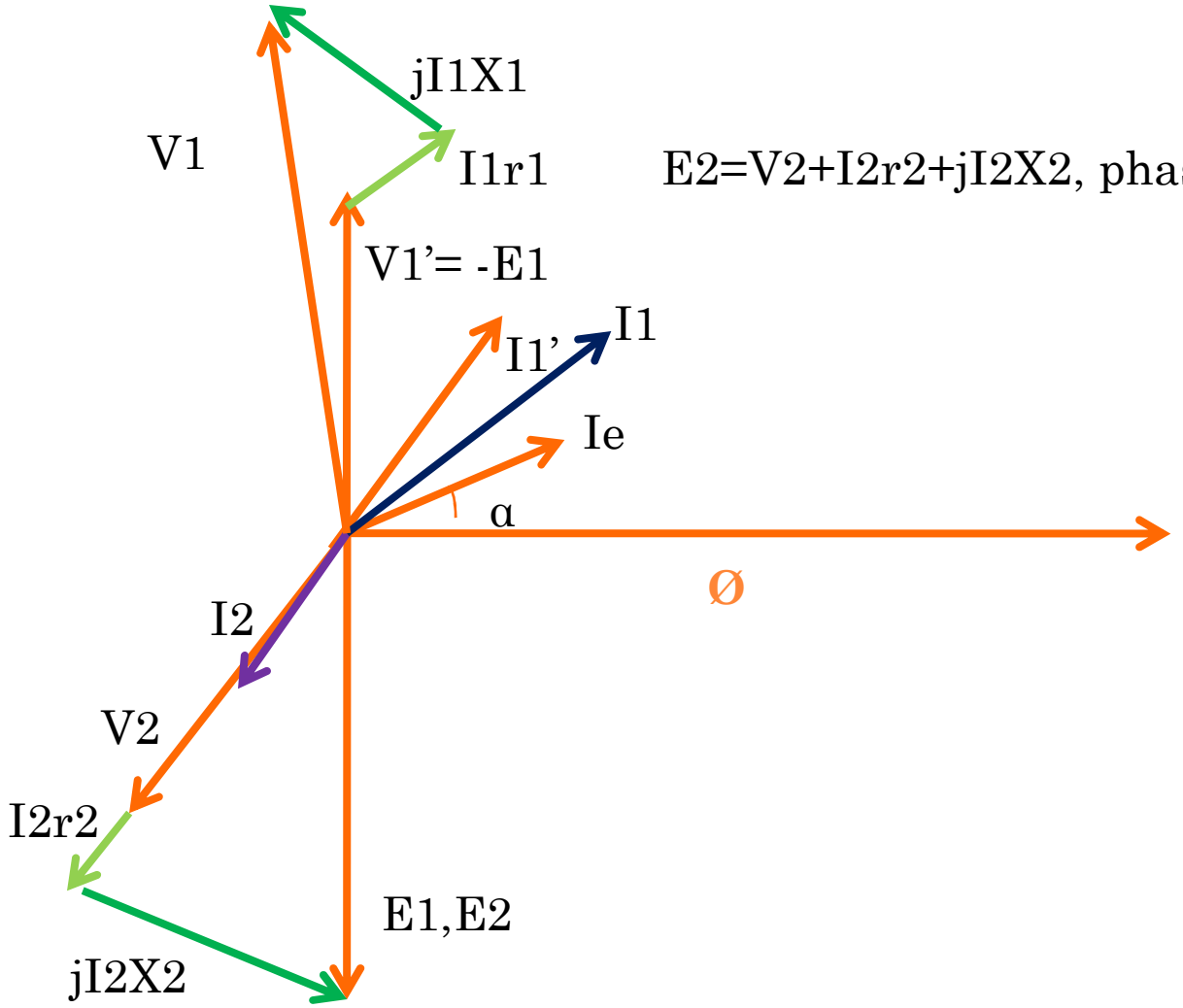


V1=V1'+I1r1+jI1X1, phasor sum

PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



PHASOR OF A TRANSFORMER FOR RESISTIVE LOAD



E2=V2+I2r2+jI2X2, phasor sum

COMMENTS? / QUESTIONS???