Turns Ratio of a Transformer

* The changing flux due to the impressed alternating current will induce a voltage E1 in the primary. If we neglect the resistance voltage drop, E1 will be exactly equal and opposite to the impressed voltage V1.

 V1 = - E1 -------------------- (1)

* Again, by Faraday’s law of electromagnetic induction,

 E1 α N1 ($\frac{φ}{t}$) -------------------- (2)



* Now, both coils are wound on the same magnetic core. So rate of change of flux will be also same for both coil.

 E2 α N2 ($\frac{φ}{t}$) -------------------- (3)

* The secondary inducted voltage E2 will be the voltage that actually appears at the secondary terminal.

 E2 = V2 -------------------- (4)

* Solving Eqn. 2 and 3 we can say that,

 $\frac{E1}{E2}$ = $\frac{N1}{N2}$

* Numerically E1 equals to V1. So,

 $\frac{V1}{V2}$ = $\frac{N1}{N2}$

* Voltage Transformation Ratio, K = $\frac{N2}{N1}$ = $\frac{V2}{V1}$

Reference Book:

1. Principles of Electrical Machines by V.K Mehta & Rohit Mehta (Chapter 7; Article 7.4)

2. Direct and Alternating Current Machinery by Rosenblat & Friedman (Chapter 14; Article 14.3)