SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

19EET103 / ELECTRIC CIRCUITS AND ELECTRON DEVICES

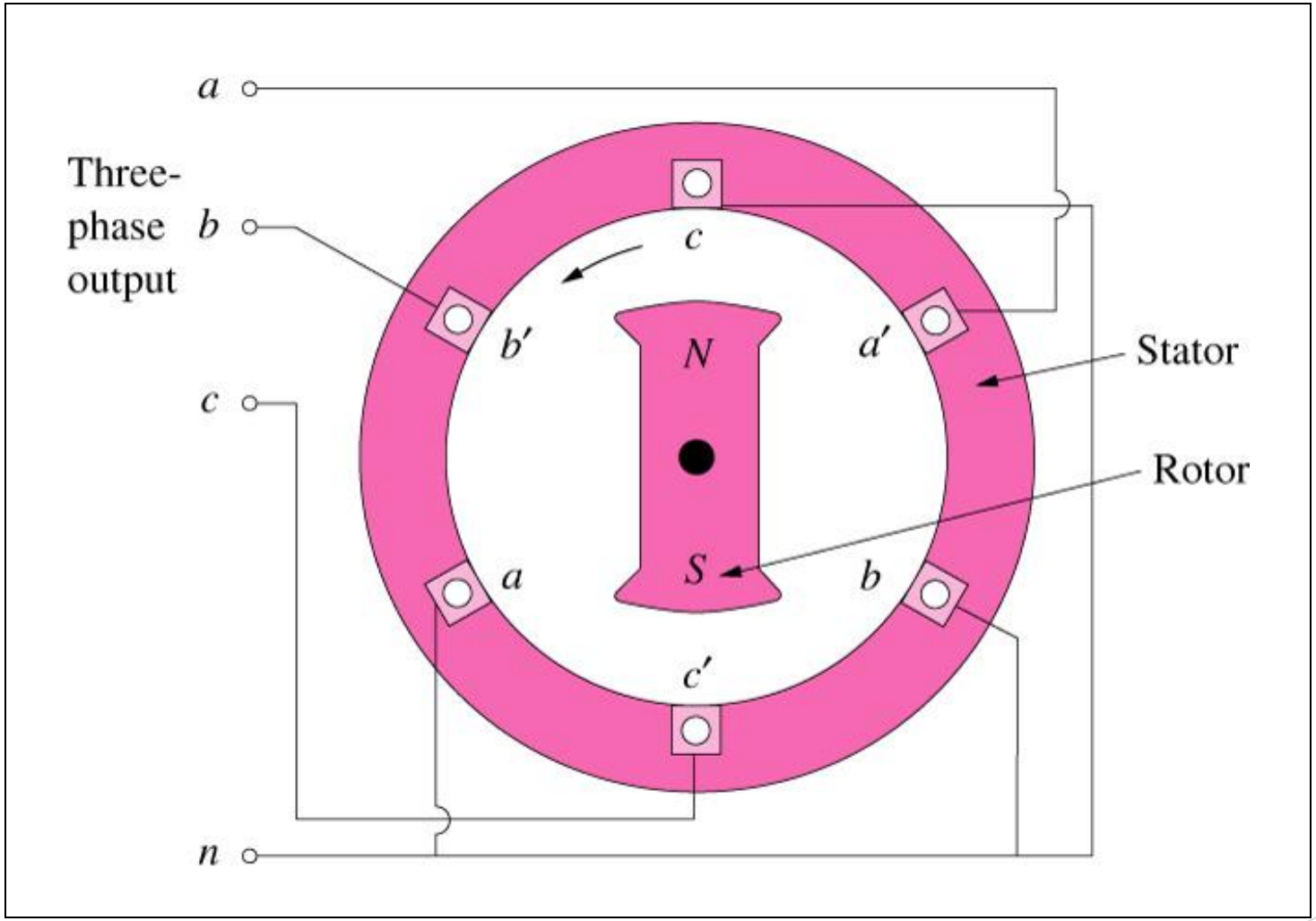
UNIT 2- AC CIRCUITS

THREE PHASE GENERATION

FARADAYS LAW

- Three things must be present in order to produce electrical current:
  a) Magnetic field
  b) Conductor
  c) Relative motion
- Conductor cuts lines of magnetic flux, a voltage is induced in the conductor
- Direction and Speed are important

THREE PHASE GENERATOR



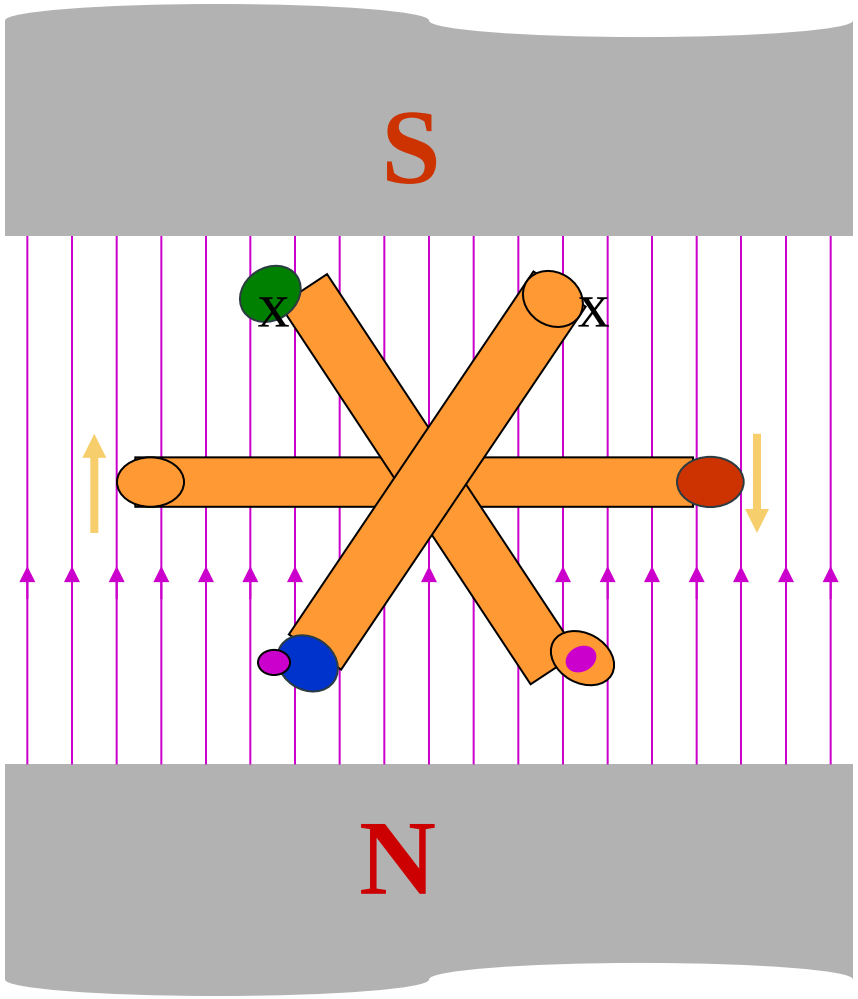
GENERATOR WORK

- The generator consists of a rotating magnet (rotor) surrounded by a stationary winding (stator).

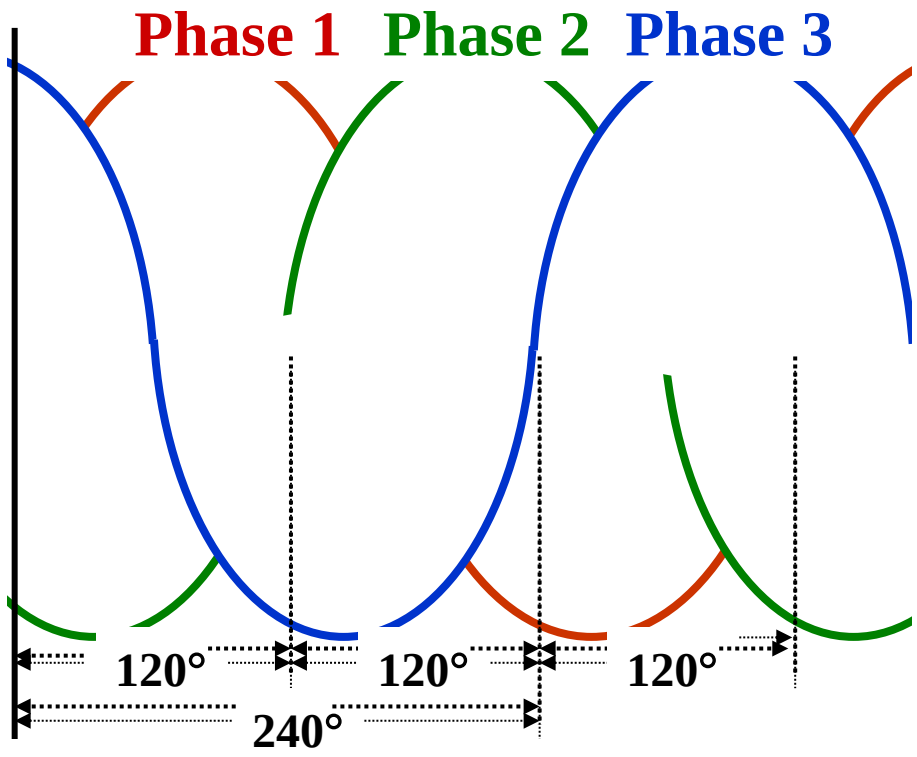
- Three separate windings or coils with terminals a-a', b-b', and c-c' are physically placed 120° apart around the stator.
- As the rotor rotates, its magnetic field cuts the flux from the three coils and induces voltages in the coils.

- The induced voltage have equal magnitude but out of phase by 120°.

GENERATION OF THREE-PHASE AC



THREE-PHASE WAVEFORM



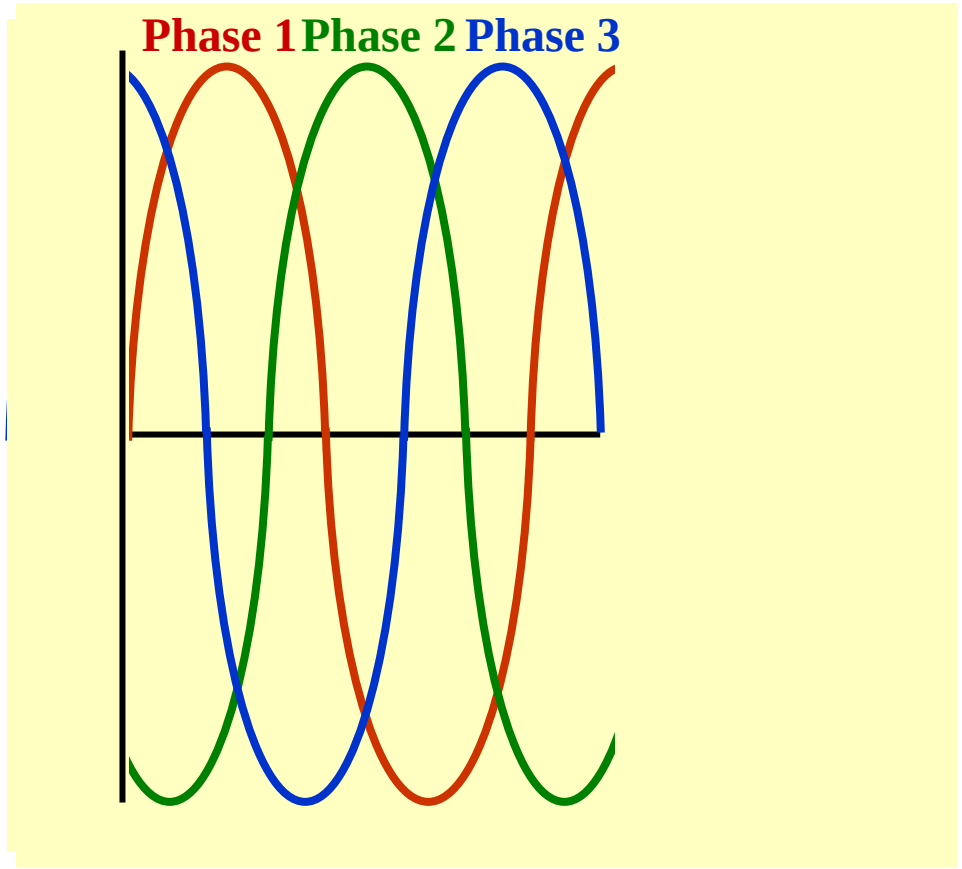
Phase 2 lags phase 1 by 120°.

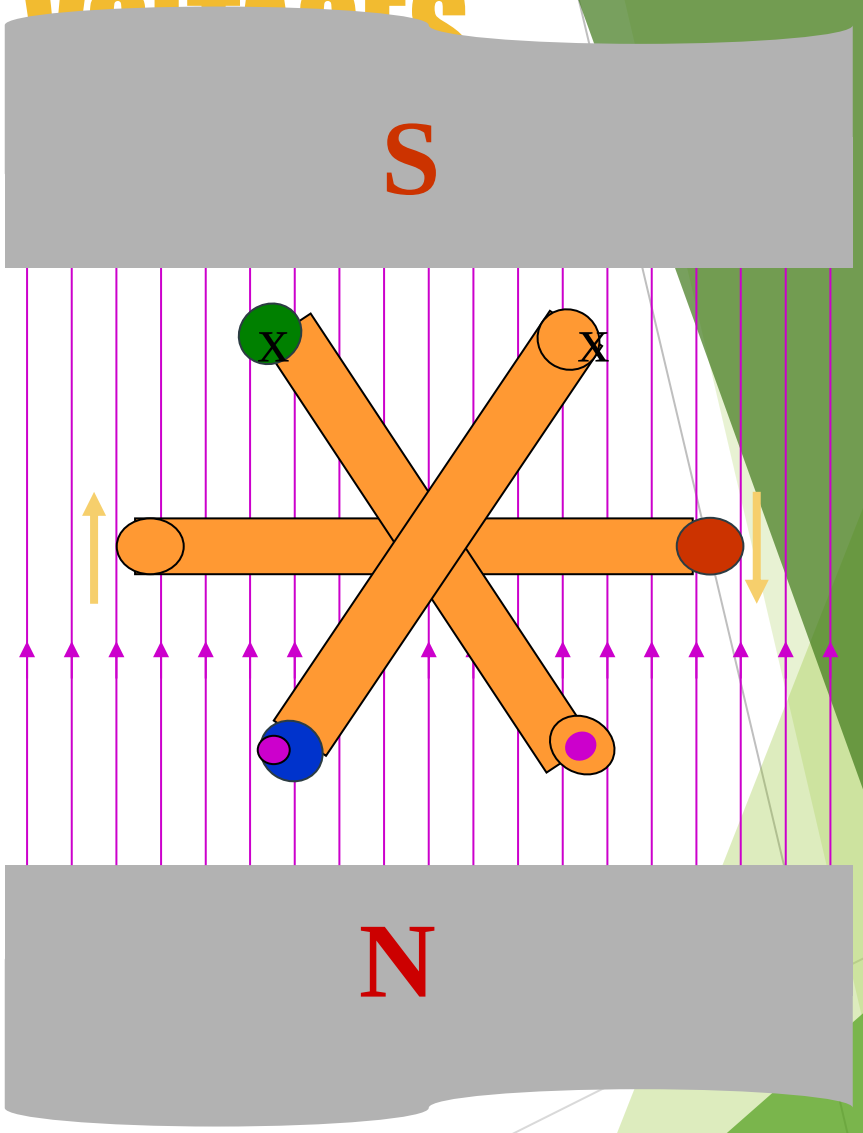
Phase 2 leads phase 3 by 120°.

Phase 3 lags phase 1 by 240°.

Phase 1 leads phase 3 by 240°.

GENERATION OF 3ϕ VOLTAGES





Phase 1 is ready to go positive.

Phase 2 is going more negative.

Phase 3 is going less positive.

THREE PHASE CIRCUIT

- POWER
  - The instantaneous power is constant

$$p(t) = p_a(t) + p_b(t) + p_c(t)$$

$$= 3\frac{V_M I_M}{2}\cos(\theta)$$

$$= 3V_{rms} I_{rms} \cos(\theta)$$

THREE PHASE CIRCUIT

- Three Phase Power,

$$\mathbf{S}_T = \mathbf{S}_A + \mathbf{S}_B + \mathbf{S}_C = 3\mathbf{S}_\phi$$

THREE PHASE QUANTITIES

QUANTITY	SYMBOL
Phase current	I_ϕ
Line current	I_L
Phase voltage	V_ϕ
Line voltage	V_L

PHASE VOLTAGES and LINE VOLTAGES

- Phase voltage is measured between the neutral and any line: line to neutral voltage
- Line voltage is measured between any two of the three lines: line to line voltage.

PHASE CURRENTS and LINE CURRENTS

- Line current (I_L) is the current in each line of the source or load.

- Phase current (I_ϕ) is the current in each phase of the source or load.

THANK YOU