



# **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**

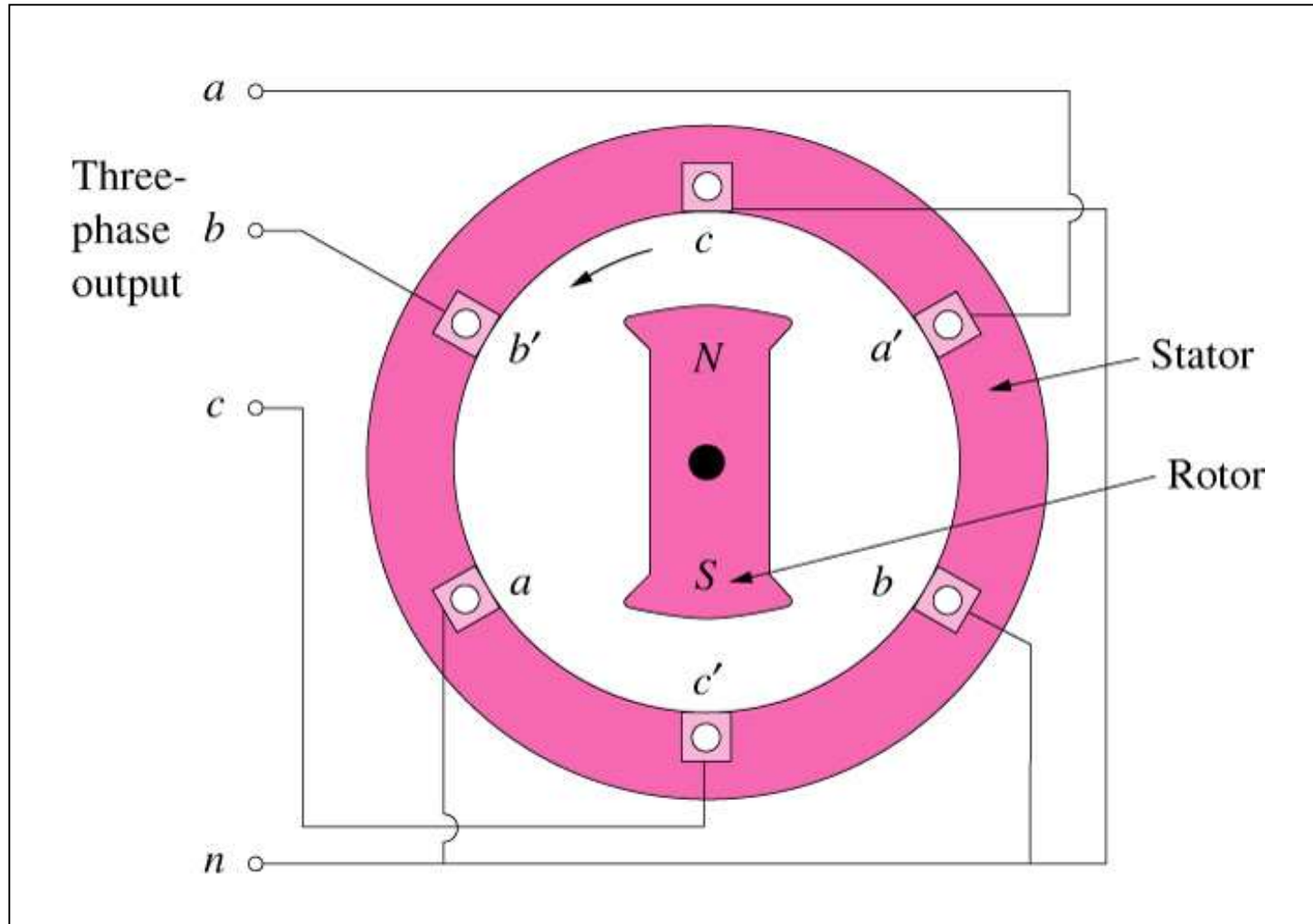
### **UNIT 2- AC CIRCUITS**

# 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

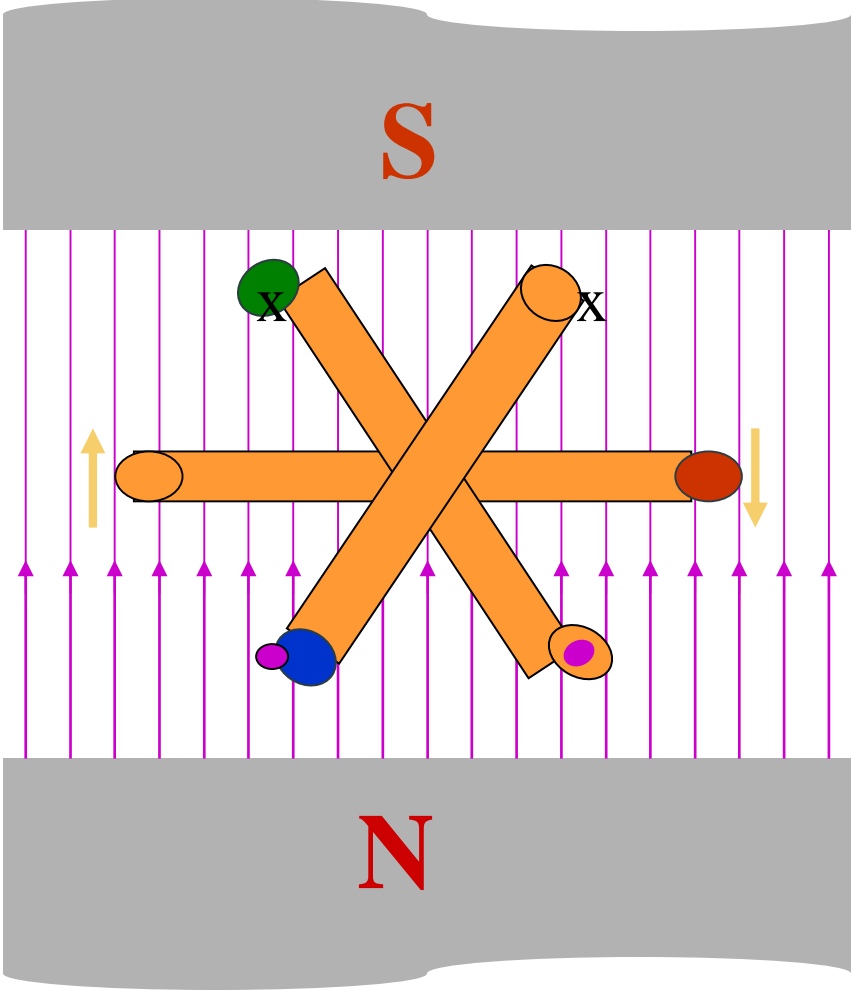
# THREE PHASE GENERATOR



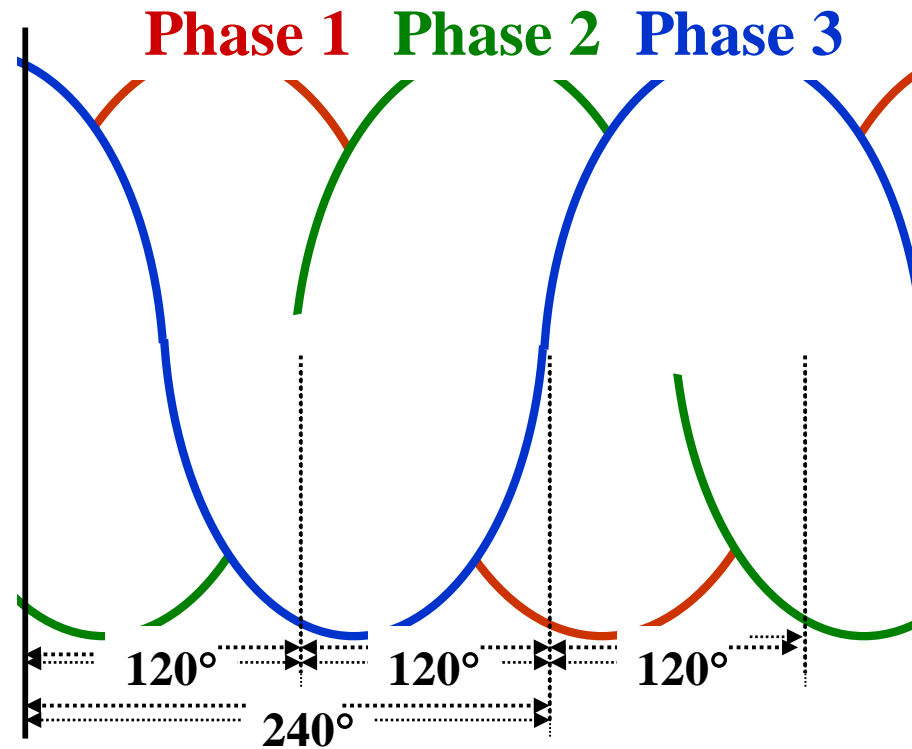
# GENERATOR WORK

- ▶ 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  $120^\circ$  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  $120^\circ$ .

# GENERATION OF THREE-PHASE AC



# THREE-PHASE WAVEFORM



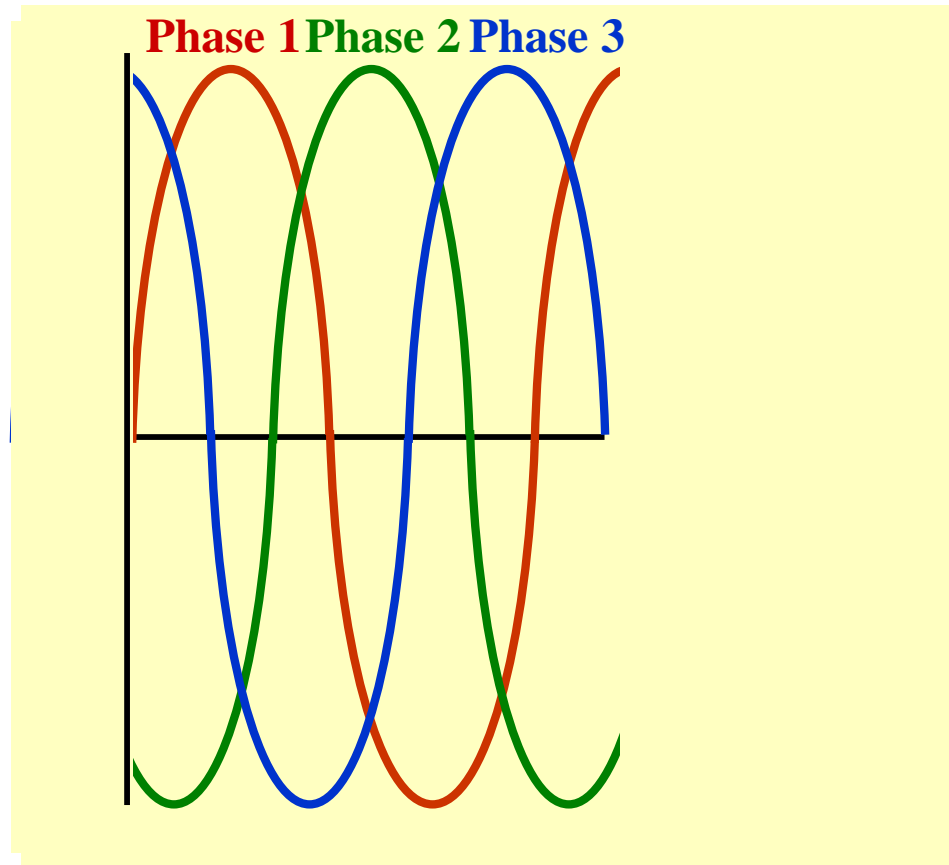
**Phase 2** lags **phase 1** by  $120^\circ$ .

**Phase 2** leads **phase 3** by  $120^\circ$ .

**Phase 3** lags **phase 1** by  $240^\circ$ .

**Phase 1** leads **phase 3** by  $240^\circ$ .

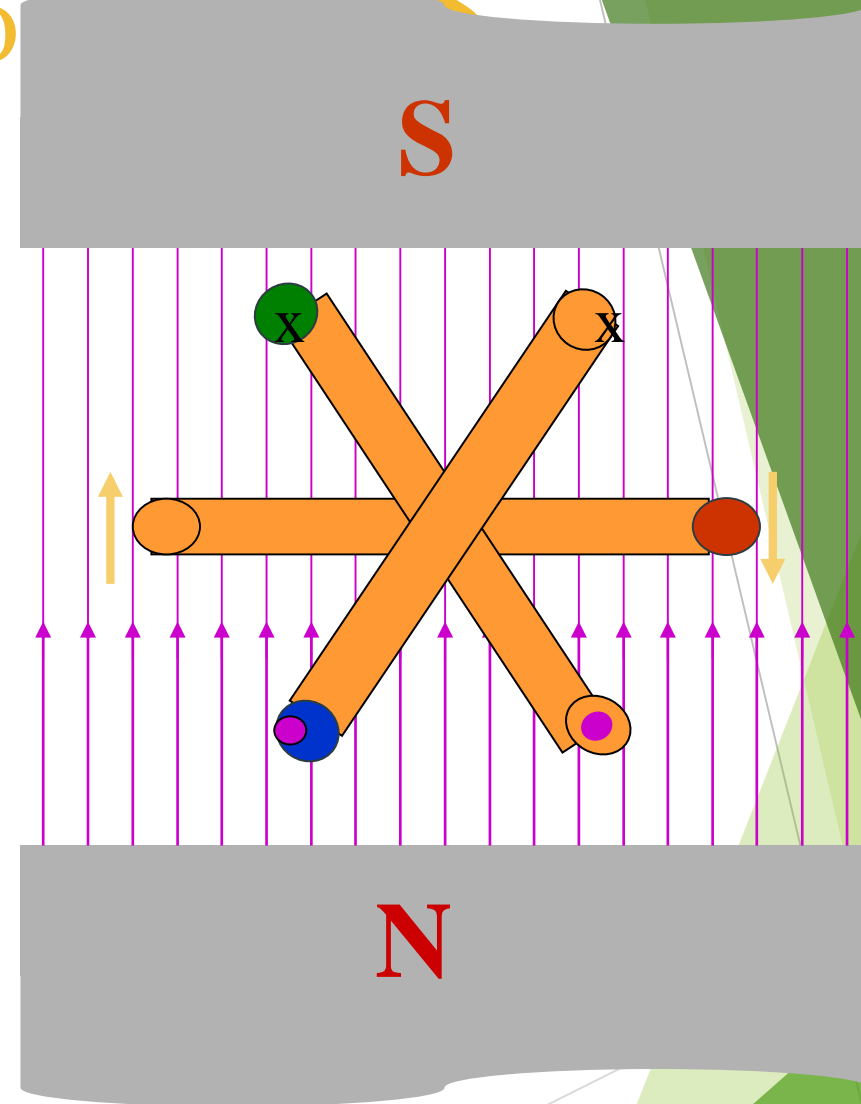
# GENERATION OF 3 $\phi$ VOLTAGES



**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

$$\begin{aligned} p(t) &= p_a(t) + p_b(t) + p_c(t) \\ &= 3 \frac{V_M I_M}{2} \cos(\theta) \\ &= 3 V_{rms} I_{rms} \cos(\theta) \end{aligned}$$

# 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

<b>QUANTITY</b>	<b>SYMBOL</b>
Phase current	$I_{\phi}$
Line current	$I_L$
Phase voltage	$V_{\phi}$
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 ( $I_\phi$ ) is the current in each **phase** of the source or load.

*THANK YOU*