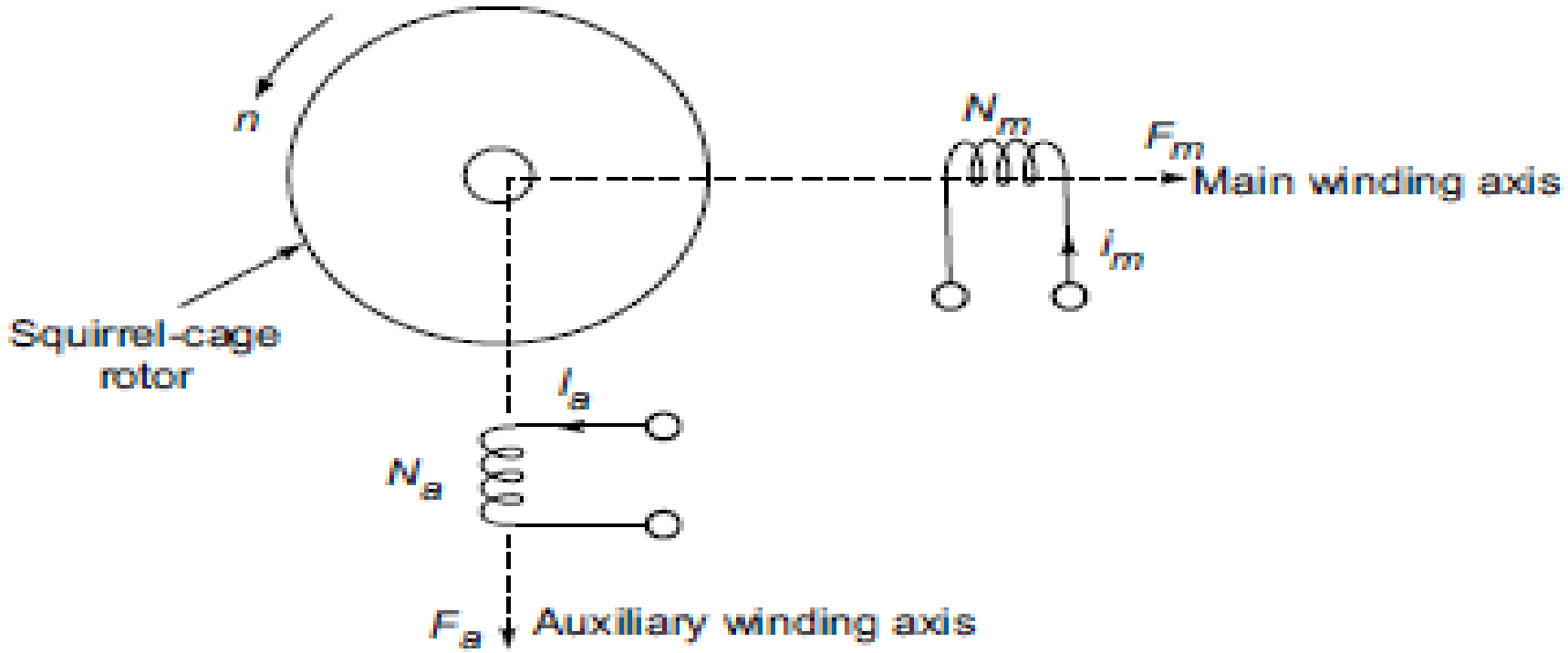
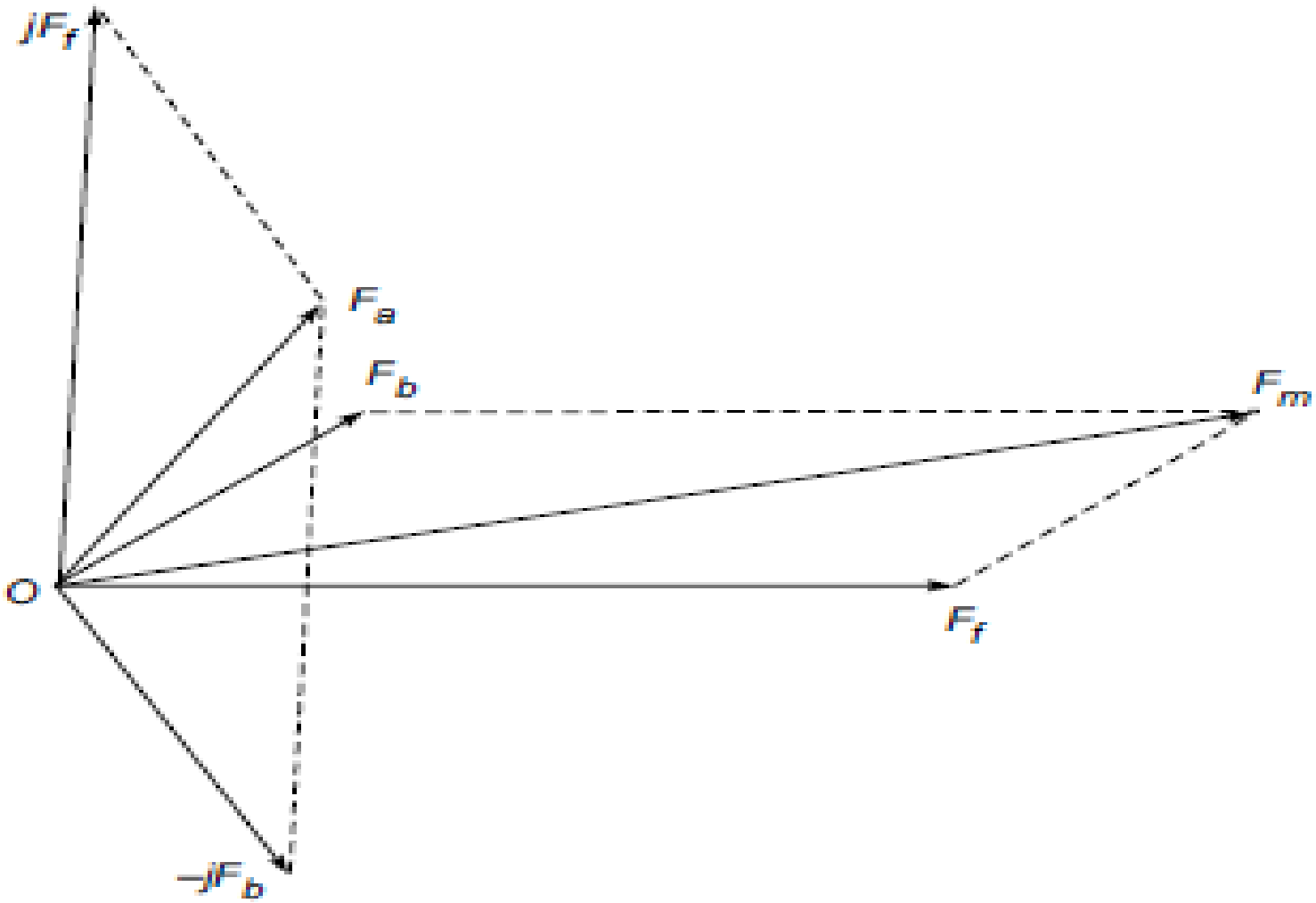
Module-4
Lecture -32

- Topic covered as:

  ✓Split phase starting of single ph-I.M and application

Split phase 1-ph I.M.




jF_f
F_a
F_b
F_m
O
F_f
$-jF_b$

- Pulsating fields F_m and F_a can be divided into two balanced sets of opposite phase sequence

$$\overline{F_m}=\overline{F_f}+\overline{F_b}$$

$$\overline{F_a}=j\overline{F_f}-j\overline{F_b}$$

- The inverse of the relationships can be expressed as

$$\overline{F_f}=\frac{1}{2}(\overline{F_m}-j\overline{F_a})$$

$$\overline{F_b}=\frac{1}{2}(\overline{F_m}+j\overline{F_a})$$

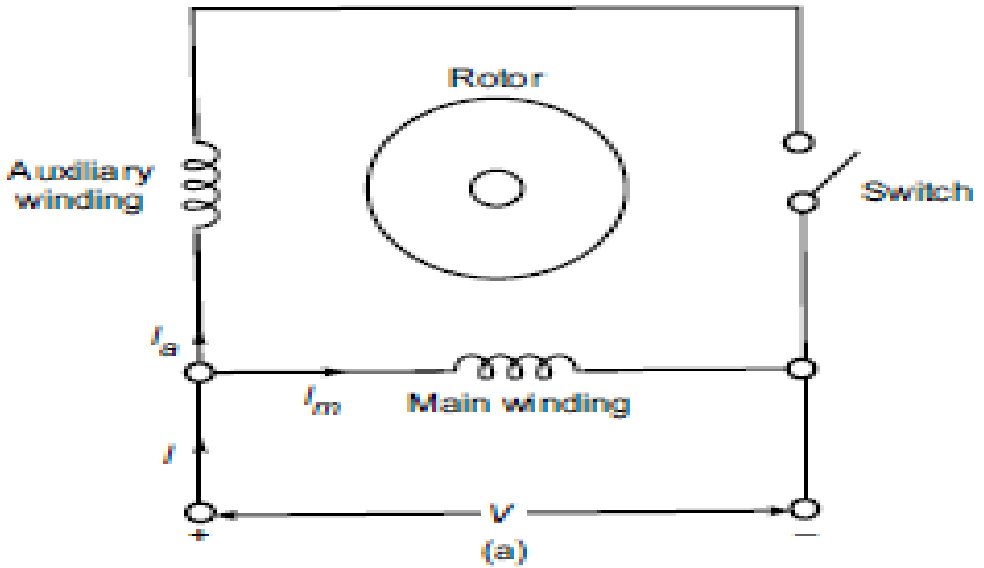
Split phase 1-ph I.M.

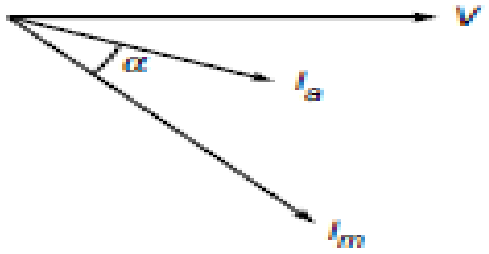
- When a motor is provided with two windings, even though these are excited from the same voltage (supply being single-phase), the currents in the two windings can be made out-of-phase by adjustment of the impedance of the auxiliary winding in relation to the main winding. As a result F_m and F_a constitute an unbalanced field set with 90° elect. space-phase relationship.
- The two symmetrical components now being unequal $F_f \neq F_b$
- The forward rotating field is made stronger than the backward rotating field resulting in the net production of starting torque.

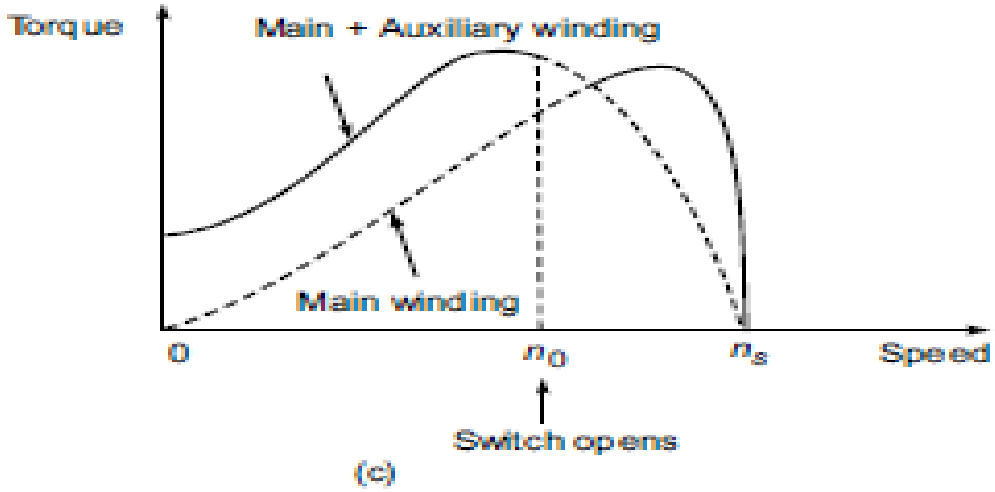
Resistance split 1 ph I.M.

- Motor employs an auxiliary winding with a higher R/X ratio as compared to the main winding.
- High R/X ratio of auxiliary winding is achieved by using a smaller number of turns of thin wire for the auxiliary winding.
- This difference in the R/X ratio causes the auxiliary winding current I_a to lead the main winding current I_m by angle α.
- Fields created by the two currents also have a phase difference of a thereby constituting an unbalanced field system. The result is the production of the starting torque

Resistance split 1 ph I.M.







Application of Resistance split 1 ph I.M.

- It has a low starting current and moderate starting torque.
- It is used for easily started loads and typical applications.
- fans, saws, grinders, blowers, centrifugal pumps, office equipment, washing machines etc.
- available in the range of 1/20 to 1/2 kW.