Chapter 4
Armature Windings

ABSTRACT

In continuing with the previous chapter which discussed armature reaction, this current chapter discusses armature windings. The authors address the issue of lap windings, method of drawing, and making the direction of current. Moreover, they discuss how to find out the location of brush placement. Then then discuss multiplex lap winding, wave winding, their method of drawing and number of parallel paths. After that, frog-leg or composite winding is discussed. Finally, they discuss scope of lap winding.

4.0 INTRODUCTION

Armature windings in d.c. machines are made of copper. The copper conductor may be of circular or rectangular cross-section. There are two basic types of windings i.e. lap and wave windings. Lap winding is suitable for low voltage heavy current applications, while wave winding is used in high voltage low current applications. These may be further classified as simplex, duplex, triplex etc. depending upon the multiplicity of windings. The coils are made of diamond shape as shown in Figure 1.

If a slide of coil spans 180° e, it is said to be a full pitch coil. If less than 180°e then it is said as fractional pitch coil. Each coil is connected to one commutator segment. The side of the armature to which commutator is connected is called front side and the other side is called back side. Usually for drawing winding layout the conductors, coils, and commutator segments are numbered and the followings are defined as;
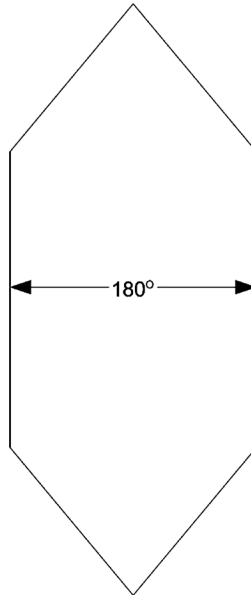
Front Pitch

It is number difference of conductors connected at the front side.(YF)

Back Pitch

It is number difference of coils connected at the back.(YB)

Figure 1.

Commutator Pitch

It is the number difference of commutator segments to which ends of a coil are connected, Y (c).

$$Y(c) = YB + YF \text{ lap winding } Yc = YF - YB \text{ for wave winding}$$

$$Yc = YF - YB \text{ for wave winding}$$

Average pitch $YA =$

$$\frac{YF + YB}{2}$$

4.1 LAP WINDINGS

Rules

- Number of conductors should be even.
- Number of conductors should be divisible by number of poles.
- YF and YB must be odd and there difference should be two.

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