## SYNOPSIS

The squirrel-cage induction motor is characterised by its simple and robust rotor and has essentially been a single-speed device. The inherent ability of the rotor to adjust itself to practically any number of stator poles has led to many an investigation to make it a variable speed one. Among these, methods of speed-changing by reconnecting the winding have long been known and used. Motors of 2 : 1 speed-ratio have been existing since 1897. However, works relating to other pole-ratios have not received much attention owing to the complicated control-gear required, until a new speed-changing logic known as pole-amplitude modulation was proposed in 1958. This method has successfully been applied to three-phase machines in a number of papers.

However, for the case of single-phase machines, attempts to speed-change have been rare and few; even they are incomplete in many respects. Speed-changing single-phase induction motors are required in shaft-mounted fans and blowers for unit-heater service and other applications. Hence these investigations are of value. The scope of the thesis is, therefore to record studies on speed-changing phenomena in single-phase induction machines. The development of the subject-matter is presented chapter - wise on the following lines.

1. The existing literature shows that it does not cover all pole-ratios. A technique known as "asymmetrical modulation" is applied to overcome this limitation.

2. In this chapter, a method known as simusoidal modulation is applied to single-phase machines and it is shown that this technique leads to a considerable reduction of terminals for a 3 - speed motor.

3. It is clear from the previous chapters that the pole-changing motor has to be invariably started at one speed, and running performance alone is obtained at other speeds. A new theory is proposed in this chapter and it leads to designs with independent starting at any of the speeds.

4. There are applications where only two-speed motors may be required. Hence fresh interpretation is given to the earlier theory and this study leads to two-speed motors different from the earlier ones.

5. The preceding chapters bring out that the speed-changing motor has good starting for the initial poles only. The theory based on "total modulation" is now extended to single-phase machines. These studies lead to design of new two-speed motors with good starting and running performances at both the speeds.

6. Low output single-phase machines usually have single-layer windings. Hence this chapter presents the study of pole-changing machines with single-layer windings.

7. The theory of speed-changing proposed is so general and flexible that it easily lends itself to produce multi-speed motors with a single-winding. This chapter illustrates this

possibility , bringing out the limitations in the design of such a winding.

8. The earlier chapters bring out the theory of speed-changing supported with experimental results. The prediction of starting and running performances is of great interest, and hence a generalised equivalent circuit applicable to any irregular winding is presented in this chapter. It has been shown that the proposed equivalent circuit is not by itself, sufficient to explain fully the differences between the calculated and measured torques. A method of accounting it is given.

The thesis finally concludes with a comparative assessment of the different modulation techniques as applied to speed-changing, single-phase machines.