PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS

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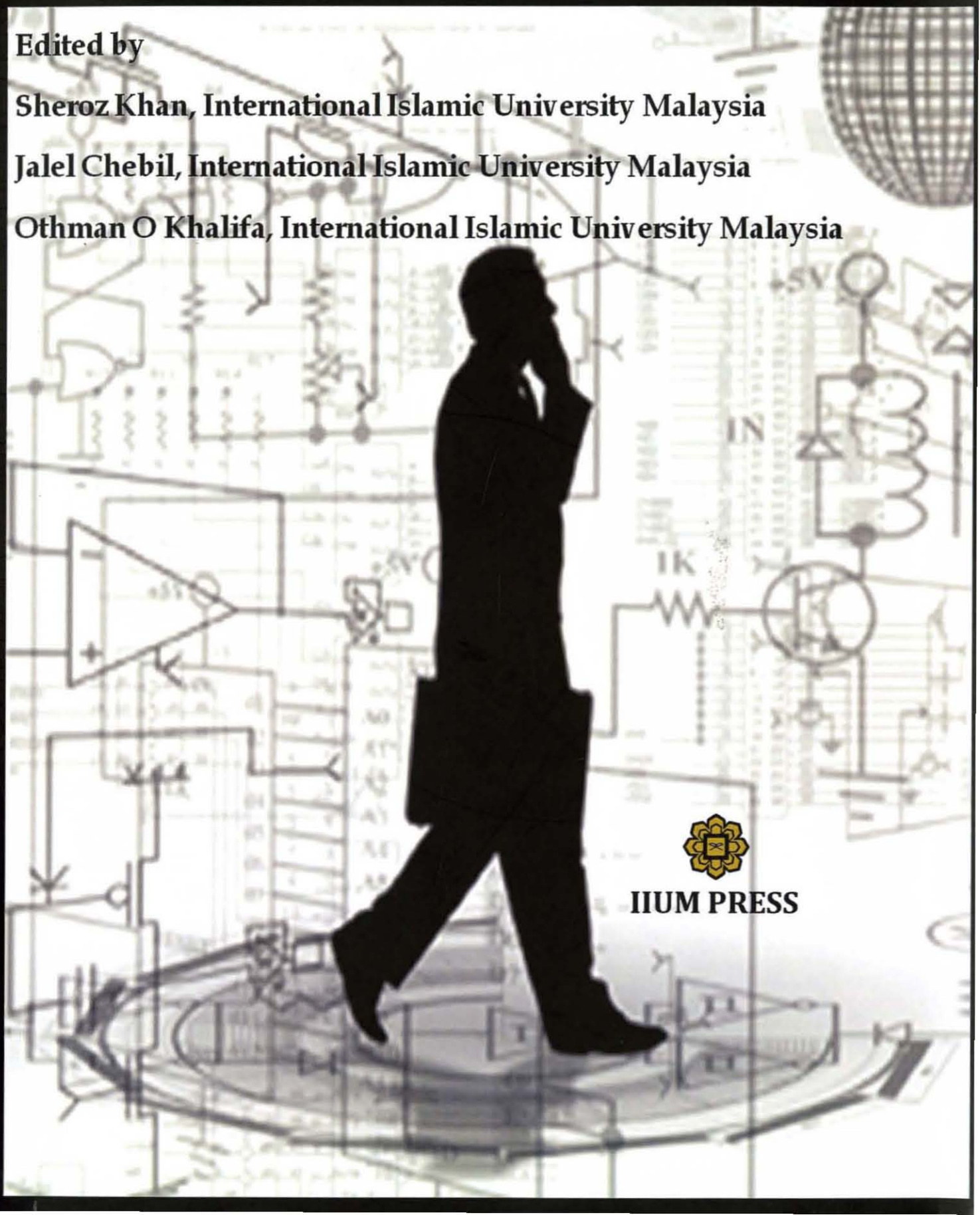

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CONTENTS

Chapter 12

MAGNETIC HYSTERESIS THEORY: APPLICATION PERSPECTIVE

ATIKA ARSHAD, RUMANA TASNIM, SHEROZ KHAN, AHM ZAHIRUL ALAM

12.0 INTRODUCTION

Magnetic materials are generally categorized into two categories, soft or hard. Soft magnetic materials are characterized by large permeability and very small coercivities while the hard one are frequently used in permanent magnet applications and are characterized by large saturation magnetizations and large coercivities. Soft and hard magnetic materials have been introduced in many applications over last few years. Applications utilizing soft/hard magnetic materials offer both economical benefits and design flexibility. A wide range of magnetic performance requirements can be met via hysteresis loop through the proper choice of materials and the appropriate processing of those materials.

12.1 FERRITES

Metallic oxide materials are called ferrites. These ferrites are substances made from iron oxide (rust) alloyed with other metals, thus they are essentially ceramics having an excellent characteristic of high resistivity. Ferrites are usually non-conductive ferromagnetic ceramic compounds. In terms of their magnetic properties, different ferrites are characterized as soft or hard in the light of their low or high magnetic coercivity.

12.2 HYSTERESIS

The variation of magnetic field from electromagnetic coil leads to an induction of current. This field varies on a range of scales and identification of these variations can be made with the considerable variation of number of turns in a coil, the rate of flow of current and the type of core material. By applying an alternating magnetic field to a magnetic material, a hysteresis loop is traced out by the magnetization. The divergence in magnetism explains how materials respond to magnetic fields. Generally magnetic hysteresis is addressed by the lag or delays of that specific magnetic material that allies to the magnetisation properties of the material. Thus, it firstly becomes magnetised and then de-magnetised. The magnetic field strength H drives the whole magnetization process. The magnetization M is generally plotted as a function of magnetic field strength H.