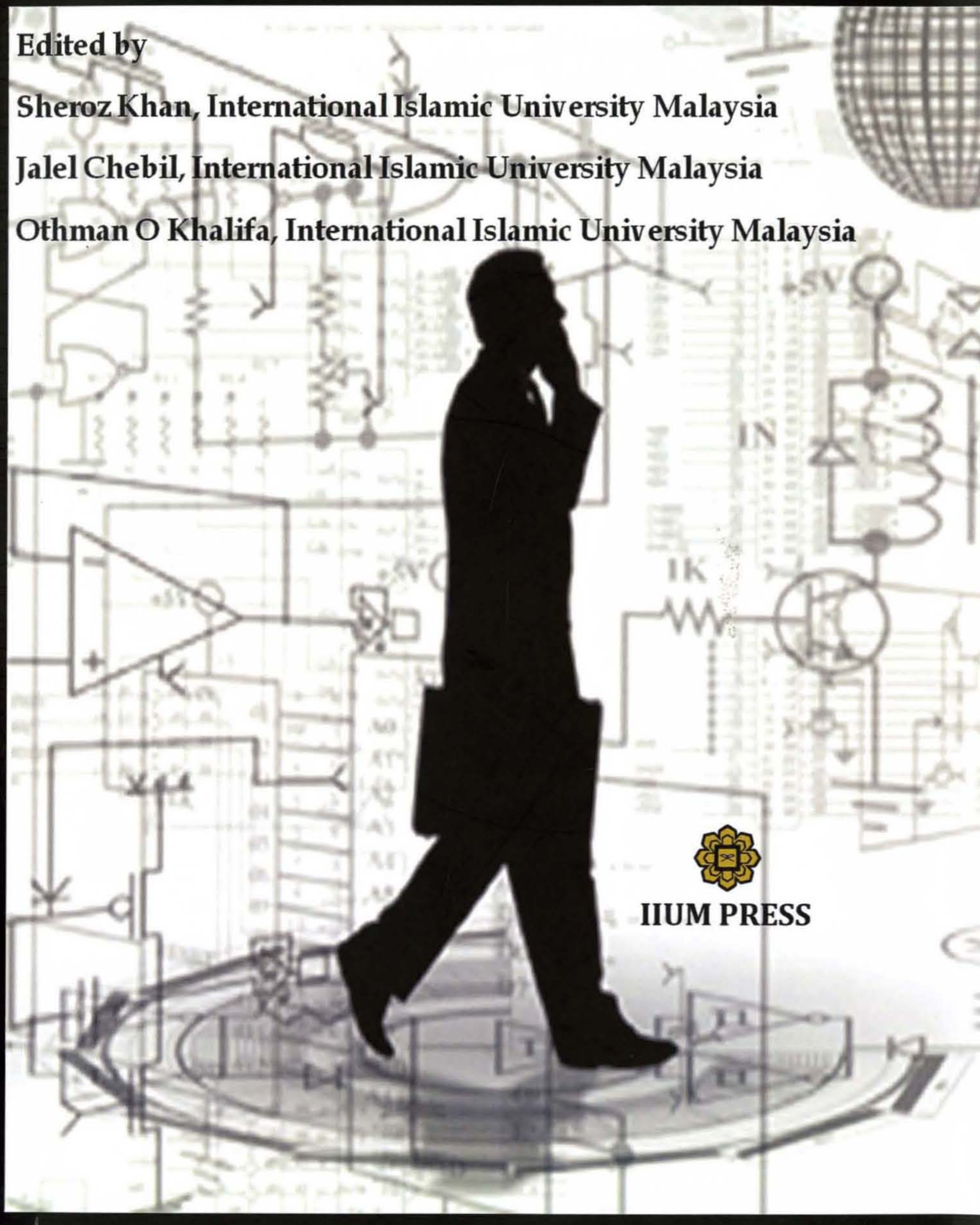
PRINCIPLES OF TRANSDUCER DEVICES AND COMPONENTS



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CONTENTS

Chapter 15

VOLTAGE SUPPLY AND VOLTAGE REGULATION

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15.0 INTRODUCTION

A stable voltage supply is important for the proper operation of electronic devices. Stability is characterized by the ability of the voltage output to stay constant and ripple-free regardless of how much load is connected to the circuit. There is a brief discussion on how much inaccuracy is caused by voltage supplies which are prone to voltage fluctuations due to switching phenomenon taking place in the circuit, load fluctuations or temperature changes.

15.1 LINE REGULATION

One of the important considerations in a stable voltage supply is the ability of the supply in terms of line regulation. This is the ability of the supply to maintain a constant output voltage even with changes in input voltage and is characterized by comparing the ratio of the two.

The input voltage can vary for a number of reasons including thermal noise, temperature drift and coupled background signals. Therefore, it is more accurate to represent the source voltage as a time-varying signal $V_s(t)$, consisting of both a DC component, V_s, and a small-signal component, $\Delta V_s(t)$. The load voltage is also time-varying, with both a DC and small-signal component [1].

$$v_s(t) = V_s + \Delta v_s(t) \tag{15.1}$$

$$v_o(t) = V_o + \Delta v_o(t) \tag{15.2}$$

Both equations (15.1) and (15.2) are mutually linked and it is therefore possible to calculate the change in output voltage as an effect of change in input voltage through the following equation:

$$lineregulation = \frac{maxchangeinoutputvoltage\ (\Delta v_o)}{maxchangeininputvoltage\ (\Delta v_s)} \tag{15.3}$$