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Electronic Equipment Reliability

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Preface

The first detailed studies of electronic equipment reliability were undertaken to improve the performance of communications and navigational systems used by the armed services. The techniques then developed were subsequently refined and applied to equipment used for many other applications where high reliability was of paramount importance, for example in civil airline electronic systems.

Developments in electronic technology during the last two decades have also caused increased interest in reliability. For example the digital computer has evolved from a rare and somewhat unreliable device into an essential management service for most large industrial and commercial concerns, and a central element in many process- and plant-control systems. Furthermore the introduction of solid-state devices and integrated circuits has so reduced the price of electronic equipment that systems of much greater complexity are now available at economic prices. As a result of the growing contributions of these systems to many industrial and commercial activities their reliability and availability have become of great interest to the equipment user, and much more attention is now paid to these qualities in system specifications.

There is thus a need for all engineers concerned with the design, testing or commissioning of electronic systems or the components from which they are assembled to understand the factors that influence reliability, the ways in which it can be measured and specified, and the means whereby it can be improved where necessary.

This book is designed to present such information at a level suitable for students in the final year of degree and diploma courses. This is considered to be the most suitable part of the course in which to introduce the subject of equipment reliability, since any detailed consideration of the topic requires some acquaintance with many aspects of electronic

engineering. Among these are analogue and digital signal transmission and processing, circuit and system design, and component characteristics and tolerances. Although the material of the book is not developed to the level generally reached in postgraduate studies, it would be a suitable introduction to the subject, to be followed by a more detailed examination of particular topics.

Many of the calculations in the book involve simple application of the laws of probability and some knowledge of statistics. Since these topics are not included in all engineering mathematics courses a summary of the material is presented in chapter 2. Apart from this the only mathematics required are elementary algebra and simple integration.

Copies of the British Standards mentioned in the text can be obtained from the British Standards Institution, Sales Branch, 101 Pentonville Road, London N1 9ND.

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