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Power Distribution System Reliability

A practical, hands-on approach to power distribution system reliability As power distribution systems age, the frequency and duration of consumer interruptions will increase significantly. Now more than ever, it is crucial for students and professionals in the electrical power industries to have a solid understanding of designing the reliable and cost-effective utility, industrial, and commercial power distribution systems needed to maintain life activities (e.g., computers, lighting, heating, cooling, etc.). This book fills the void in the literature by providing readers with everything they need to know to make the best design decisions for new and existing power distribution systems, as well as to make quantitative "cost vs. reliability" trade-off studies. Topical coverage includes: Engineering economics Reliability analysis of complex network configurations Designing reliability into industrial and commercial power systems Application of zone branch reliability methodology Equipment outage statistics Deterministic planning criteria Customer interruption for cost models for load-point reliability assessment Isolation and restoration procedures And much more Each chapter begins with an introduction and ends with a conclusion and a list of references for further reading. Additionally, the book contains actual utility and industrial power system design problems worked out with real examples, as well as additional problem sets and their solutions. Power Distribution System Reliability is essential reading for practicing engineers, researchers, technicians, and advanced undergraduate and graduate students in electrical power industries.

System Reliability

Researchers from the entire world write to figure out their newest results and to contribute new ideas or ways in the field of system reliability and maintenance. Their articles are grouped into four sections: reliability, reliability of electronic devices, power system reliability and feasibility and maintenance. The book is a valuable tool for professors, students and professionals, with its presentation of issues that

may be taken as examples applicable to practical situations. Some examples defining the contents can be highlighted: system reliability analysis based on goal-oriented methodology; reliability design of water-dispensing systems; reliability evaluation of drivetrains for off-highway machines; extending the useful life of asset; network reliability for faster feasibility decision; analysis of standard reliability parameters of technical systems' parts; cannibalisation for improving system reliability; mathematical study on the multiple temperature operational life testing procedure, for electronic industry; reliability prediction of smart maximum power point converter in photovoltaic applications; reliability of die interconnections used in plastic discrete power packages; the effects of mechanical and electrical straining on performances of conventional thick-film resistors; software and hardware development in the electric power system; electric interruptions and loss of supply in power systems; feasibility of autonomous hybrid AC/DC microgrid system; predictive modelling of emergency services in electric power distribution systems; web-based decision-support system in the electric power distribution system; preventive maintenance of a repairable equipment operating in severe environment; and others.

Reliability Analysis of Water Distribution Systems

On up-to-date methodologies for the reliability analysis and reliability-based design of water distribution systems. Brings together many new methodologies that can prove valuable in the assessment of aging water distribution systems and in the design and expansion of water supply systems. No index. Acidic paper. Annotation copyright Book News, Inc

Repairable Systems Reliability Analysis

This book provides an application-oriented framework for reliability modeling and analysis of repairable systems in conjunction with the procurement process of weapon systems and throughput analysis for industries. Most of the reliability literature is directed towards non-repairable systems, that is, systems that fail are discarded or replaced. This book is mainly dedicated towards providing coverage to the reliability modeling and analysis of repairable systems that undergo failure-repair cycles. This unique book provides a comprehensive framework for the modeling and analysis of repairable systems considering both the non-parametric and parametric approaches to deal with their failure data. The book presents MCF based non-parametric approach with several illustrative examples and the generalized renewal process (GRP) based arithmetic reduction of age (ARA) models along with its applications to the systems failure data from the aviation industry. A complete chapter on an integrated framework for procurement process is devoted by utilizing the concepts of multi-criteria decision-making (MCDM) techniques which will of a great assistance to the readers in enhancing the potential of their respective organizations. This book also presents FMEA methods tailored for GRP based repairs. This text has primarily emerged from the industrial experience and research work of the authors. A number of illustrations have been included to make the subject lucid and vivid even to the readers who are relatively new to this area. Besides, various examples have been provided to display the applicability of presented models and methodologies to assist the readers in applying the concepts presented in this book.

Systems Engineering

A substantial amount of research has been conducted on consecutive k-out-of-n and related reliability systems over the past four decades. These systems have been used to model various engineering systems such as the microwave stations of telecoms network, oil pipeline systems, and vacuum systems in an electron accelerator. As such, studies of reliability properties of consecutive k-out-of-n structures have attracted significant attention from both theoretical and practical approaches. In the modern era of technology, the redundancies are employed in the various industrial systems to prevent them from failure/sudden failure or to recover from failures. This book is meant to provide knowledge and help engineers and academicians in understanding reliability engineering by using k-out-of-n structures. The material is also targeted at postgraduate or senior undergraduate students pursuing reliability engineering.

System Reliability Management

This book provides the latest research advances in the field of system reliability assurance and engineering. It contains reference material for applications of reliability in system engineering, offering a theoretical sound background with adequate numerical illustrations. Included are concepts pertaining

to reliability analysis, assurance techniques and methodologies, tools, and practical applications of system reliability modeling and allocation. The collection discusses various soft computing techniques like artificial intelligence and particle swarm optimization approach for reliability assessment. Importance of differentiating between the optimal release time and testing stop time of the software has been explicitly discussed and presented in the book. Features: Creates understanding of the costs associated with complex systems Covers reliability measurement of engineering systems Incorporates an efficient effort-based expenditure policy incorporating cost and reliability criteria Provides information for optimal testing stop and release time of software system Presents software performance and security layout Addresses reliability prediction and its maintenance through advanced analytics techniques Overall, System Reliability Management: Solutions and Techniques is a collaborative and interdisciplinary approach for better communication of problems and solutions to increase the performance of the system for better utilization and resource management.

Performance and Reliability Analysis of Computer Systems

Performance and Reliability Analysis of Computer Systems: An Example-Based Approach Using the SHARPE Software Package provides a variety of probabilistic, discrete-state models used to assess the reliability and performance of computer and communication systems. The models included are combinatorial reliability models (reliability block diagrams, fault trees and reliability graphs), directed, acyclic task precedence graphs, Markov and semi-Markov models (including Markov reward models), product-form queueing networks and generalized stochastic Petri nets. A practical approach to system modeling is followed; all of the examples described are solved and analyzed using the SHARPE tool. In structuring the book, the authors have been careful to provide the reader with a methodological approach to analytical modeling techniques. These techniques are not seen as alternatives but rather as an integral part of a single process of assessment which, by hierarchically combining results from different kinds of models, makes it possible to use state-space methods for those parts of a system that require them and non-state-space methods for the more well-behaved parts of the system. The SHARPE (Symbolic Hierarchical Automated Reliability and Performance Evaluator) package is the 'toolchest' that allows the authors to specify stochastic models easily and solve them quickly, adopting model hierarchies and very efficient solution techniques. All the models described in the book are specified and solved using the SHARPE language; its syntax is described and the source code of almost all the examples discussed is provided. Audience: Suitable for use in advanced level courses covering reliability and performance of computer and communications systems and by researchers and practicing engineers whose work involves modeling of system performance and reliability.

Systems Reliability and Risk Analysis

Ernst G. Frankel This book has its origin in lecture notes developed over several years for use in a course in Systems Reliability for engineers concerned with the design of physical systems such as civil structures, power plants, and transport vehicles of all types. Increasing public concern with the reliability of systems for reasons of human safety, environmental protection, and acceptable investment risk limitations has resulted in an increasing interest by engineers in the formal application of reliability theory to engineering design. At the same time there is a demand for more effective approaches to the design of procedures for the operation and use of man-made systems and more meaningful assessment of the risks introduced and use of such a system poses both when operating as designed and when operating at below design performance. The purpose of the book is to provide a sound, yet practical, introduction to reliability analysis and risk assessment which can be used by professionals in engineering, planning, management, and economics to improve the design, operation, and risk assessment of systems of interest. The text should be useful for students in many disciplines and is designed for fourth-year undergraduates or first-year graduate students. I would like to acknowledge the help of many of my graduate students who contributed to the development of this book by offering comments and criticism. Similarly I would like to thank Mrs.

Electric Power Distribution Reliability, Second Edition

Due to its high impact on the cost of electricity and its direct correlation with customer satisfaction, distribution reliability continues to be one of the most important topics in the electric power industry. Continuing in the unique tradition of the bestselling first edition, Electric Power Distribution Reliability, Second Edition consolidates all pertinent topics on electric power distribution into one comprehensive volume balancing theory, practical knowledge, and real world applications. Updated and expanded

with new information on benchmarking, system hardening, underground conversion, and aging infrastructure, this timely reference enables you to— · Manage aging infrastructure · Harden electric power distribution systems · Avoid common benchmarking pitfalls · Apply effective risk management The electric power industry will continue to make distribution system reliability and customer-level reliability a top priority. Presenting a wealth of useful knowledge, *Electric Power Distribution Reliability, Second Edition* remains the only book that is completely dedicated to this important topic.

System Reliability

Researchers from the entire world write to figure out their newest results and to contribute new ideas or ways in the field of system reliability and maintenance. Their articles are grouped into four sections: reliability, reliability of electronic devices, power system reliability and feasibility and maintenance. The book is a valuable tool for professors, students and professionals, with its presentation of issues that may be taken as examples applicable to practical situations. Some examples defining the contents can be highlighted: system reliability analysis based on goal-oriented methodology; reliability design of water-dispensing systems; reliability evaluation of drivetrains for off-highway machines; extending the useful life of asset; network reliability for faster feasibility decision; analysis of standard reliability parameters of technical systems' parts; cannibalisation for improving system reliability; mathematical study on the multiple temperature operational life testing procedure, for electronic industry; reliability prediction of smart maximum power point converter in photovoltaic applications; reliability of die interconnections used in plastic discrete power packages; the effects of mechanical and electrical straining on performances of conventional thick-film resistors; software and hardware development in the electric power system; electric interruptions and loss of supply in power systems; feasibility of autonomous hybrid AC/DC microgrid system; predictive modelling of emergency services in electric power distribution systems; web-based decision-support system in the electric power distribution system; preventive maintenance of a repairable equipment operating in severe environment; and others.

Recent Advances in System Reliability

Recent Advances in System Reliability discusses developments in modern reliability theory such as signatures, multi-state systems and statistical inference. It describes the latest achievements in these fields, and covers the application of these achievements to reliability engineering practice. The chapters cover a wide range of new theoretical subjects and have been written by leading experts in reliability theory and its applications. The topics include: concepts and different definitions of signatures (D-spectra), their properties and applications to reliability of coherent systems and network-type structures; LZ-transform of Markov stochastic process and its application to multi-state system reliability analysis; methods for cost-reliability and cost-availability analysis of multi-state systems; optimal replacement and protection strategy; and statistical inference. *Recent Advances in System Reliability* presents many examples to illustrate the theoretical results. Real world multi-state systems, such as power generation and transmission, refrigeration, and production systems, are considered in the form of case studies, making the book a useful resource for researchers and postgraduate students.

Reliability Analysis for Asset Management of Electric Power Grids

A practical guide to facilitate statistically well-founded decisions in the management of assets of an electricity grid. Effective and economic electric grid asset management and incident management involve many complex decisions on inspection, maintenance, repair and replacement. This timely reference provides statistically well-founded, tried and tested analysis methodologies for improved decision making and asset management strategy for optimum grid reliability and availability. The techniques described are also sufficiently robust to apply to small data sets enabling asset managers to deal with early failures or testing with limited sample sets. The book describes the background, concepts and statistical techniques to evaluate failure distributions, probabilities, remaining lifetime, similarity and compliancy of observed data with specifications, asymptotic behavior of parameter estimators, effectiveness of network configurations and stocks of spare parts. It also shows how the graphical representation and parameter estimation from analysis of data can be made consistent, as well as explaining modern upcoming methodologies such as the Health Index and Risk Index. Key features: Offers hands-on tools and techniques for data analysis, similarity index, failure forecasting, health and risk indices and the resulting maintenance strategies. End-of-chapter problems and solutions to facilitate self-study via a book companion website. The book is essential reading for advanced

undergraduate and graduate students in electrical engineering, quality engineers, utilities and industry strategists, transmission and distribution system planners, asset managers and risk managers.

New Trends in System Reliability Evaluation

The subject of system reliability evaluation has never been so extensively and incisively discussed as in the present volume. The book fills a gap in the existing literature on the subject by highlighting the shortcomings of the current state-of-the-art and focusing on on-going efforts aimed at seeking better models, improved solutions and alternative approaches to the problem of system reliability evaluation. The book's foremost objective is to provide an insight into developments that are likely to revolutionize the art and science in the near future. At the same time it will help serve as a benchmark for the reader not only to understand and appreciate the newer developments but to profitably guide him in reorienting his efforts. This book will be valuable for people working in various industries, research organizations, particularly in electrical and electronics, defence, nuclear, chemical, space and communication systems. It will also be useful for serious-minded students, teachers, and for the laboratories of educational institutions.

Reliability Analysis Using MINITAB and Python

Reliability Analysis Using MINITAB and Python Complete overview of the theory and fundamentals of Reliability Analysis applied with Minitab and Python tools Reliability Analysis Using Minitab and Python expertly applies Minitab and Python programs to the field of reliability engineering, presenting basic concepts and explaining step-by-step how to implement statistical distributions and reliability analysis methods using the two programming languages. The textbook enables readers to effectively use software to efficiently process massive amounts of data while also reducing human error. Examples and case studies as well as exercises and questions are included throughout to enable a smooth learning experience. Excel files containing the sample data and Minitab and Python example files are also provided. Students who have basic knowledge of probability and statistics will find this textbook highly approachable. Nonetheless, it also covers material on basic statistics at the beginning, so students who are not familiar with statistics can follow the material as well. Written by a highly qualified author in the field, sample topics covered in Reliability Analysis Using Minitab and Python include: Establishing a basic statistical background, with a focus on probability, joint probability, union probability, conditional probability, mutually exclusive events, and bayes' rule Statistical distributions, with a focus on discrete cases, continuous cases, exponential distribution, Weibull distribution, normal distribution, and log-normal distribution Reliability data plotting, with a focus on straight line properties, least squares fit, linear rectification, exact failure times, and readout failure data Accelerated life testing, with a focus on accelerated testing theory, exponential distribution acceleration, and Weibull distribution acceleration System failure modeling, with a focus on reliability block diagram, series system model, parallel system model, k-out-of-n system model, and minimal paths and minimal cuts. Repairable systems, with a focus on corrective and preventive maintenances, availability, maintainability, and preventive maintenance scheduling Reliability Analysis Using Minitab and Python serves as an excellent introductory level textbook on the topic for both undergraduate and graduate students. It presents information clearly and concisely and includes many helpful additional learning resources to aid in understanding of concepts, information retention, and practical application.

Advances in Reliability Analysis and its Applications

This book presents the latest research in the fields of reliability theory and its applications, providing a comprehensive overview of reliability engineering and discussing various tools, techniques, strategies and methods within these areas. Reliability analysis is one of the most multidimensional topics in the field of systems reliability engineering, and while its rapid development creates opportunities for industrialists and academics, it also means that it is hard to keep up to date with the research taking place. By gathering findings from institutions around the globe, the book offers insights into the international developments in the field. As well as discussing the current areas of research, it also identifies knowledge gaps in reliability theory and its applications and highlights fruitful avenues for future research. Covering topics from life cycle sustainability to performance analysis of cloud computing, this book is ideal for upper undergraduate and postgraduate researchers studying reliability engineering.

System Reliability Toolkit

This textbook provides an introduction to probabilistic reliability analysis of power systems. It discusses a range of probabilistic methods used in reliability modelling of power system components, small systems and large systems. It also presents the benefits of probabilistic methods for modelling renewable energy sources. The textbook describes real-life studies, discussing practical examples and providing interesting problems, teaching students the methods in a thorough and hands-on way. The textbook has chapters dedicated to reliability models for components (reliability functions, component life cycle, two-state Markov model, stress-strength model), small systems (reliability networks, Markov models, fault/event tree analysis) and large systems (generation adequacy, state enumeration, Monte-Carlo simulation). Moreover, it contains chapters about probabilistic optimal power flow, the reliability of underground cables and cyber-physical power systems. After reading this book, engineering students will be able to apply various methods to model the reliability of power system components, smaller and larger systems. The textbook will be accessible to power engineering students, as well as students from mathematics, computer science, physics, mechanical engineering, policy & management, and will allow them to apply reliability analysis methods to their own areas of expertise.

Probabilistic Reliability Analysis of Power Systems

This book addresses a modern topic in reliability: multi-state and continuous-state system reliability, which has been intensively developed in recent years. It offers an up-to-date overview of the latest developments in reliability theory for multi-state systems, engineering applications to a variety of technical problems, and case studies that will be of interest to reliability engineers and industrial managers. It also covers corresponding theoretical issues, as well as case studies illustrating the applications of the corresponding theoretical advances. The book is divided into two parts: Modern Mathematical Methods for Multi-state System Reliability Analysis (Part 1), and Applications and Case Studies (Part 2), which examines real-world multi-state systems. It will greatly benefit scientists and researchers working in reliability, as well as practitioners and managers with an interest in reliability and performability analysis. It can also be used as a textbook or as a supporting text for postgraduate courses in Industrial Engineering, Electrical Engineering, Mechanical Engineering, Applied Mathematics, and Operations Research.

Recent Advances in Multi-state Systems Reliability

The NATO Advanced Study Institute is, to quote the Notes for Applicants "primarily a high level teaching activity at which a carefully defined subject is presented in a systematic and coherently structured programme. The subject is treated in considerable depth by eminent lecturers . . . • . ." The NATO ASI on Generic Techniques in Systems Reliability Assessment was held at the University of Liverpool and the Proceedings are presented in the present volume. Regrettably many of the papers are in shortened version. This was an inter disciplinary assembly designed to focus on the synthesis of generic reliability concepts and technology and to discuss relevant teaching and research in universities and colleges. One important objective was, of course, to give opportunity for interchange of information on advanced techniques in reliability in various fields. The Institute was held in Dale Hall, one of the halls of residence of the University of Liverpool, England, from 17th to 28th July, 1973. Sixty-four engineers from twelve countries attended, namely, 27 from U. K. , 14 from U. S. A. 8 from Italy, 4 from West Germany, 2 from France, 2 from the Netherlands, 2 from Sweden each from Belgium, Canada, Denmark, India and Norway. and one Seven of these had their wives and some brought their children also. The technical affiliations which were represented were 23 universities, 22 national laboratories, 11 industry, 5 military, 3 consultants.

Generic Techniques in Systems Reliability Assessment

Power system reliability is the focus of intensive study due to its critical role in providing energy supply to modern society. This comprehensive book describes application of some new specific techniques: universal generating function method and its combination with Monte Carlo simulation and with random processes methods, Semi-Markov and Markov reward models and genetic algorithm. The book can be considered as complementary to power system reliability textbooks.

New Computational Methods in Power System Reliability

This book covers reliability assessment and prediction of new technologies such as next generation networks that use cloud computing, Network Function Virtualization (NVF), Software Defined Network (SDN), Next Generation Transport, Evolving Wireless Systems, Digital VoIP Telephony, and Reliability

Testing techniques specific to Next Generation Networks (NGN). This book introduces the technology to the reader first, followed by advanced reliability techniques applicable to both hardware and software reliability analysis. The book covers methodologies that can predict reliability using component failure rates to system level downtimes. The book's goal is to familiarize the reader with analytical techniques, tools and methods necessary for analyzing very complex networks using very different technologies. The book lets readers quickly learn technologies behind currently evolving NGN and apply advanced Markov modeling and Software Reliability Engineering (SRE) techniques for assessing their operational reliability. Covers reliability analysis of advanced networks and provides basic mathematical tools and analysis techniques and methodology for reliability and quality assessment; Develops Markov and Software Engineering Models to predict reliability; Covers both hardware and software reliability for next generation technologies.

Next Generation and Advanced Network Reliability Analysis

This book contains extended versions of 34 carefully selected and reviewed papers presented at the Third International Conference on Mathematical Methods in Reliability, held in Trondheim, Norway in 2002. It provides a broad overview of current research activities in reliability theory and its applications. There are chapters on reliability modelling, network and system reliability, reliability optimization, survival analysis, degradation and maintenance modelling, and software reliability. The authors are all leading experts in the field. A particular feature of the book is a historical review by Professor Richard E Barlow, well known for his pioneering research on reliability. The list of authors also includes the plenary session speakers Odd O Aalen, Philip J Boland, Sallie A Keller-McNulty, and Nozer Singpurwalla. Contents: Reliability Theory in the Past and Present Centuries; General Aspects of Reliability Modelling; Reliability of Networks and Systems; Stochastic Modelling and Optimization in Reliability; Modelling in Survival and Reliability Analysis; Statistical Methods for Degradation Data; Statistical Methods for Maintained Systems; Statistical Inference in Survival Analysis; Software Reliability Methods. Readership: Graduate students, academics and professionals in probability & statistics, reliability analysis, survival analysis, industrial engineering, software engineering, operations research and applied mathematics research.

Mathematical and Statistical Methods in Reliability

Offers timely and comprehensive coverage of dynamic system reliability theory This book focuses on hot issues of dynamic system reliability, systematically introducing the reliability modeling and analysis methods for systems with imperfect fault coverage, systems with function dependence, systems subject to deterministic or probabilistic common-cause failures, systems subject to deterministic or probabilistic competing failures, and dynamic standby sparing systems. It presents recent developments of such extensions involving reliability modelling theory, reliability evaluation methods, and features numerous case studies based on real-world examples. The presented dynamic reliability theory can enable a more accurate representation of actual complex system behavior, thus more effectively guiding the reliable design of real-world critical systems. Dynamic System Reliability: Modelling and Analysis of Dynamic and Dependent Behaviors begins by describing the evolution from the traditional static reliability theory to the dynamic system reliability theory, and provides a detailed investigation of dynamic and dependent behaviors in subsequent chapters. Although written for those with a background in basic probability theory and stochastic processes, the book includes a chapter reviewing the fundamentals that readers need to know in order to understand contents of other chapters which cover advanced topics in reliability theory and case studies. The first book systematically focusing on dynamic system reliability modelling and analysis theory Provides a comprehensive treatment on imperfect fault coverage (single-level/multi-level or modular), function dependence, common cause failures (deterministic and probabilistic), competing failures (deterministic and probabilistic), and dynamic standby sparing Includes abundant illustrative examples and case studies based on real-world systems Covers recent advances in combinatorial models and algorithms for dynamic system reliability analysis Offers a rich set of references, providing helpful resources for readers to pursue further research and study of the topics Dynamic System Reliability: Modelling and Analysis of Dynamic and Dependent Behaviors is an excellent book for undergraduate and graduate students, and engineers and researchers in reliability and related disciplines.

Dynamic System Reliability

An introduction and explanation of pragmatic methods and techniques for reliability and risk studies, and a discussion of their uses and limitations. It features computer software that illustrates numerous examples found in the book, offering to help engineers and students solve problems. There is a module on Bayesian estimation. The computer disk is written in Visual Basic and is compatible with Microsoft Excel spreadsheets.

Reliability Engineering and Risk Analysis

This book equips the reader with a compact information source on all the most recent methodological tools available in the area of reliability prediction and analysis. Topics covered include reliability mathematics, organisation and analysis of data, reliability modelling and system reliability evaluation techniques. Environmental factors and stresses are taken into account in computing the reliability of the involved components. The limitations of models, methods, procedures, algorithms and programmes are outlined. The treatment of maintained systems is designed to aid the worker in analysing systems with more realistic and practical assumptions. Fault tree analysis is also extensively discussed, incorporating recent developments. Examples and illustrations support the reader in the solving of problems in his own area of research. The chapters provide a logical and graded presentation of the subject matter bearing in mind the difficulties of a beginner, whilst bridging the information gap for the more experienced reader. The work will be of considerable interest to engineers working in various industries, research organizations, particularly in defence, nuclear, chemical, space or communications. It will also be an indispensable study aid for serious-minded students and teachers.

Reliability Analysis and Prediction

As engineering systems become more and more complex, industry has recognized the importance of system and product reliability and places ever increasing emphasis on it during the design phase. Despite its efforts, however, industry continues to lose billions of dollars each year because of unexpected system failures. Therefore, it becomes increasingly important for designers and engineers to have a solid grounding in reliability engineering and keep abreast of new developments and research results.

Design Reliability

This book contains the lectures given in the International Course "Improving efficiency and reliability in water supply systems\

Improving Efficiency and Reliability in Water Distribution Systems

Software Reliability Assessment with OR Applications is a comprehensive guide to software reliability measurement, prediction, and control. It provides a thorough understanding of the field and gives solutions to the decision-making problems that concern software developers, engineers, practitioners, scientists, and researchers. Using operations research techniques, readers will learn how to solve problems under constraints such as cost, budget and schedules to achieve the highest possible quality level. Software Reliability Assessment with OR Applications is a comprehensive text on software engineering and applied statistics, state-of-the art software reliability modeling, techniques and methods for reliability assessment, and related optimization problems. It addresses various topics, including: unification methodologies in software reliability assessment; application of neural networks to software reliability assessment; software reliability growth modeling using stochastic differential equations; software release time and resource allocation problems; and optimum component selection and reliability analysis for fault tolerant systems. Software Reliability Assessment with OR Applications is designed to cater to the needs of software engineering practitioners, developers, security or risk managers, and statisticians. It can also be used as a textbook for advanced undergraduate or postgraduate courses in software reliability, industrial engineering, and operations research and management.

Software Reliability Assessment with OR Applications

Written for those who have taken a first course in statistical methods, this book takes a modern, computer-oriented approach to describe the statistical techniques used for the assessment of reliability.

Statistical Analysis of Reliability Data

Learn about the techniques used for evaluating the reliability and availability of engineered systems with this comprehensive guide.

Reliability and Availability Engineering

This study investigates the patterns that describe reliability of water distribution networks focusing to the node connectivity, energy balance, and economics of construction, operation and maintenance. A number of measures to evaluate the network resilience has been developed and assessed to arrive at more accurate diagnostics of regular and irregular demand scenarios. These measures have been proposed as a part of the methodology for snap-shot assessment of network reliability based on its configuration and hydraulic performance. Practical outcome of the research is the decision support tool for reliability-based design of water distribution networks. This computer package named NEDRA (NEtwork Design and Reliability Assessment) consists of the modules for network generation, filtering, initialisation, optimisation, diagnostics and cost calculation, which can be used for sensitivity analyses of single network layout or assessments of multiple layouts. The study concludes that none of the analysed aspects develops clear singular patterns. Nevertheless, the proposed network buffer index (NBI) and the hydraulic reliability diagram (HRD) as visual representation of the network resilience give sufficient snap-shot pointing the composition of the index value, and displaying possible weak points in the network that can be hidden behind the averaged values of various reliability measures.

Pattern Recognition for Reliability Assessment of Water Distribution Networks

This book offers a broad and detailed view about how traditional distribution systems are evolving smart/active systems. The reader will be able to share the view of a number of researchers directly involved in this field. For this sake, philosophical discussions are enriched by the presentation of theoretical and computational tools. A senior reader may incorporate some concepts not available during his/her graduation process, whereas new Engineers may have contact with some material that may be essential to his/her practice as professionals.

Planning and Operation of Active Distribution Networks

"Markov modeling has long been accepted as a fundamental and powerful technique for the fault tolerance analysis of mission-critical applications. However, the elaborate computations required have often made Markov modeling too time-consuming to be of practical use on these complex systems. With this hands-on tool, designers can use the Markov modeling technique to analyze safety, reliability, maintainability, and cost-effectiveness factors in the full range of complex systems in use today. Featuring ground-breaking simulation software and a comprehensive reference manual, MARKOV MODELING FOR RELIABILITY ANALYSIS helps system designers surmount the mathematical computations that have previously prevented effective reliability analysis. The text and software compose a valuable self-study tool that is complete with detailed explanations, examples, and a library of Markov models that can be used for experiments and as derivations for new simulation models. The book details how these analyses are conducted, while providing hands-on instruction on how to develop reliability models for the full range of system configurations. Computer-Aided Rate Modeling and Simulation (CARMS) software is an integrated modeling tool that includes a diagram-based environment for model setup, a spreadsheet like interface for data entry, an expert system link for automatic model construction, and an interactive graphic interface for displaying simulation results."

Modeling for Reliability Analysis

We are becoming more and more dependent on reliable distribution of electricity. The demand for cost efficiency has at the same time increased since new incentives have appeared. This book presents methods for finding a balance between the aims of high reliability and cost effectiveness. A key aspect is to evaluate the impacts of outages and the benefits of risk reducing investments. Put in a wider context, this is asset management, which can be summarized as the art of finding a balance between risk, cost and performance. This book is built on the experience of a wide number of case studies of different reliability projects and is focused on applicable tools for the reader. Basically the book gathers the most important parts of the asset management process into one place.

Reliability Analysis and Asset Management Applied to Power Distribution

"Examining reliability, availability, and risk analysis and reviewing in probability and statistics essential to understanding reliability methods, this outstanding volume describes day-to-day techniques used by practicing engineers -- discussing important reliability aspects of both components and complex systems. "

What Every Engineer Should Know about Reliability and Risk Analysis

Multi-state System Reliability Analysis and Optimization for Engineers and Industrial Managers presents a comprehensive, up-to-date description of multi-state system (MSS) reliability as a natural extension of classical binary-state reliability. It presents all essential theoretical achievements in the field, but is also practically oriented. New theoretical issues are described, including: • combined Markov and semi-Markov processes methods, and universal generating function techniques; • statistical data processing for MSSs; • reliability analysis of aging MSSs; • methods for cost-reliability and cost-availability analysis of MSSs; and • main definitions and concepts of fuzzy MSS. Multi-state System Reliability Analysis and Optimization for Engineers and Industrial Managers also discusses life cycle cost analysis and practical optimal decision making for real world MSSs. Numerous examples are included in each section in order to illustrate mathematical tools. Besides these examples, real world MSSs (such as power generating and transmission systems, air-conditioning systems, production systems, etc.) are considered as case studies. Multi-state System Reliability Analysis and Optimization for Engineers and Industrial Managers also describes basic concepts of MSS, MSS reliability measures and tools for MSS reliability assessment and optimization. It is a self-contained study resource and does not require prior knowledge from its readers, making the book attractive for researchers as well as for practical engineers and industrial managers.

Multi-state System Reliability Analysis and Optimization for Engineers and Industrial Managers

This study collected information on valves, valve maintenance, and management, and developed a software modeling program for water utilities to develop cost-effective valve management plans. The model can find weaknesses in valve systems, identify critical valves and locations for the addition of new valves, and assess the impacts of the reliability of valves on customer outage. Using this model, it is possible to improve the performance of valve systems cost effectively by adding more valves in the system and improving the maintenance program, and thus, the reliability of valves. Includes CD-ROM with the Strategic Valve Management Model.

Criteria for Valve Location and System Reliability

With the growing complexity of engineered systems, reliability has increased in importance throughout the twentieth century. Initially developed to meet practical needs, reliability theory has become an applied mathematical discipline that permits a priori evaluations of various reliability indices at the design stages. These evaluations help engineers choose an optimal system structure, improve methods of maintenance, and estimate the reliability on the basis of special testing. Probabilistic Reliability Engineering focuses on the creation of mathematical models for solving problems of system design. Broad and authoritative in its content, Probabilistic Reliability Engineering covers all mathematical models associated with probabilistic methods of reliability analysis, including--unique to this book--maintenance and cost analysis, as well as many new results of probabilistic testing. To provide readers with all necessary background material, this text incorporates a thorough review of the fundamentals of probability theory and the theory of stochastic processes. It offers clear and detailed treatment of reliability indices, the structure function, load-strength reliability models, distributions with monotone intensity functions, repairable systems, the Markov models, analysis of performance effectiveness, two-pole networks, optimal redundancy, optimal technical diagnosis, and heuristic methods in reliability. Throughout the text, an abundance of real world examples and case studies illustrate and illuminate the theoretical points under consideration. For engineers in design, operations research, and maintenance, as well as cost analysts and R&D managers, Probabilistic Reliability Engineering offers the most lucid, comprehensive treatment of the subject available anywhere. About the editor JAMES A. FALK is Professor and Chairman of the Department of Operations Research at George Washington University. In addition to his numerous publications, Dr. Falk has lectured internationally as a Fulbright Lecturer. Of related interest... The reliability-testing "bible" for three generations of Eastern European scientists, adapted for Western scientists and engineers... HANDBOOK OF RELIABILITY ENGINEERING Originally published in the USSR, Handbook of Reliability Engineering set the standard for the reliability testing of technical systems for nearly three generations of applied scientists and engineers. Authored by a group of

prominent Soviet specialists in reliability, it provides professionals and students with a comprehensive reference covering mathematical formulas and techniques for incorporating reliability into engineering designs and testing procedures. Divided into twenty-four self-contained chapters, the Handbook details reliability fundamentals, examines common reliability problems and solutions, provides a collection of computation formulas, and illustrates practical applications. The Handbook's Russian editor and internationally recognized expert Igor A. Ushakov has joined with American engineering professionals to bring this indispensable resource to English-speaking engineers and scientists. 1994 (0-471-57173-3) 663 pp.

Probabilistic Reliability Engineering

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