

# ELECTRICAL TRANSFORMERS AND ROTATING MACHINES

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ROTATING ELECTRICAL MACHINES  
DYNAMICS OF ROTATING MACHINES  
ELECTRIC POWER SYSTEMS COMPONENTS  
IEEE STANDARDS ON ROTATING MACHINES  
VIBRATIONS IN ROTATING MACHINERY  
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DESIGN, MODELING AND RELIABILITY IN ROTATING MACHINERY  
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DESIGN OF ROTATING ELECTRICAL MACHINES  
DIAGNOSTICS OF ROTATING MACHINES IN POWER PLANTS  
TRANSFORMER AND ROTATING MACHINES  
RECIPROCATING MACHINERY DYNAMICS  
VIBRATION DAMPING, CONTROL, AND DESIGN  
THE MECHANICS OF ELECTRICAL ROTATING MACHINES  
MAINTENANCE, RELIABILITY AND TROUBLESHOOTING IN ROTATING MACHINERY  
MECHANICAL ENGINEERING AND CONTROL SYSTEMS - PROCEEDINGS OF 2015 INTERNATIONAL CONFERENCE (MECS2015)  
INTELLIGENT SYSTEMS AND APPLICATIONS  
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NOW IN ITS SECOND EDITION THIS BOOK IS AN EXCELLENT RESOURCE FOR ELECTRICAL STUDENTS AND PROFESSIONALS WHO NEED A COMPREHENSIVE EXPLANATION OF THEORY AND PRACTICAL APPLICATIONS OF ELECTRICAL MACHINES THE BOOK INCLUDES NINE EXPERIMENTS ENABLING READERS TO REINFORCE THE THEORY DISCUSSED EARLIER STUDENTS BEGIN WITH A STUDY OF MAGNETISM AND MAGNETIC INDUCTION SINGLE PHASE ISOLATION TRANSFORMERS CURRENT TRANSFORMERS AND AUTOTRANSFORMERS A UNIT ON THREE PHASE POWER REFRESHES THE STUDENT WITH BASIC THREE PHASE CONNECTIONS AND CALCULATIONS BEFORE PROCEEDING INTO THREE PHASE TRANSFORMERS

IN THIS BOOK A GENERAL MATRIX BASED APPROACH TO MODELING ELECTRICAL MACHINES IS PROMULGATED THE MODEL USES INSTANTANEOUS QUANTITIES FOR KEY VARIABLES AND ENABLES THE USER TO EASILY TAKE INTO ACCOUNT ASSOCIATIONS BETWEEN ROTATING MACHINES AND STATIC CONVERTERS SUCH AS IN VARIABLE SPEED DRIVES GENERAL EQUATIONS OF ELECTROMECHANICAL ENERGY CONVERSION ARE ESTABLISHED EARLY IN THE TREATMENT OF THE TOPIC AND THEN APPLIED TO SYNCHRONOUS INDUCTION AND DC MACHINES THE PRIMARY CHARACTERISTICS OF THESE MACHINES ARE ESTABLISHED FOR STEADY STATE BEHAVIOR AS WELL AS FOR VARIABLE SPEED SCENARIOS IMPORTANT NEW APPLICATIONS FOR THIS TECHNOLOGY SUCH AS WIND TURBINES ELECTRIC PROPULSION SYSTEMS FOR LARGE SHIPS ETC ARE ADDRESSED AND THE BOOK IS ILLUSTRATED WITH A LARGE NUMBER OF INFORMATIVE AND DETAILED PHOTOGRAPHS PROVIDED BY VARIOUS COMPANIES AT THE LEADING EDGE OF RESEARCH AND APPLICATIONS IN THE FIELD

ROTATING MACHINES ARE THE MACHINES WHICH ARE MADE UP OF TWO MAIN PARTS THE ROTOR AND THE STATOR THE NON MOVING SEGMENT OF THE MACHINE IS KNOWN AS THE STATOR AND THE ROTATING SEGMENT IS KNOWN AS THE ROTOR ROTATING MACHINES FIND A WIDE VARIETY OF USES IN A NUMBER OF DOMAINS SUCH AS DOMESTIC APPLIANCES TRANSPORTATION VEHICLES AND INDUSTRIAL MANUFACTURING

PLANTS AC AND DC MACHINES ARE PROMINENT EXAMPLES OF ROTATING MACHINES IN AC MACHINES THE ROTOR IS USED AS THE FIELD AND THE STATOR IS USED AS THE ARMATURE WHILE THE REVERSE IS APPLICABLE FOR DC MACHINES THIS BOOK PROVIDES SIGNIFICANT INFORMATION TO HELP DEVELOP A GOOD UNDERSTANDING OF ROTATING MACHINES AND THEIR DYNAMICS IT IS A VALUABLE COMPILATION OF TOPICS RANGING FROM THE BASIC TO THE MOST COMPLEX ADVANCEMENTS IN THIS FIELD THIS BOOK WILL SERVE AS A VALUABLE SOURCE OF REFERENCE FOR GRADUATE AND POST GRADUATE STUDENTS

THIS ESSENTIAL TEXT CONTAINS THE PAPERS FROM THE 8TH INTERNATIONAL IMECHE CONFERENCE ON VIBRATIONS IN ROTATING MACHINERY HELD AT THE UNIVERSITY OF WALES SWANSEA IN SEPTEMBER 2004 THE THEMES OF THE VOLUME ARE NEW DEVELOPMENTS AND INDUSTRIAL APPLICATIONS OF CURRENT TECHNOLOGY RELEVANT TO THE VIBRATION AND NOISE OF ROTATING MACHINES AND ASSEMBLIES TOPICS INCLUDE ROTOR BALANCING INCLUDING ACTIVE AND AUTOMATIC BALANCING SPECIAL ROTATING MACHINES INCLUDING MICROMACHINES OIL FILM BEARINGS AND DAMPERS ACTIVE CONTROL METHODS FOR ROTATING MACHINES SMART MACHINE TECHNOLOGY DYNAMICS OF ASSEMBLED ROTORS COMPONENT LIFE PREDICTIONS AND LIFE EXTENSION STRATEGIES THE DYNAMICS OF GEARED SYSTEMS CRACKED ROTORS DETECTION LOCATION AND PROGNOSIS CHAOTIC BEHAVIOUR IN MACHINES EXPERIMENTAL METHODS AND DISCOVERIES

DESIGN MODELING AND RELIABILITY IN ROTATING MACHINERY THIS BROAD COLLECTION OF CURRENT ROTATING MACHINERY TOPICS WRITTEN BY INDUSTRY EXPERTS IS A MUST HAVE FOR ROTATING EQUIPMENT ENGINEERS MAINTENANCE PERSONNEL STUDENTS AND ANYONE ELSE WANTING TO STAY ABREAST WITH CURRENT ROTATING MACHINERY CONCEPTS AND TECHNOLOGY ROTATING MACHINERY REPRESENTS A BROAD CATEGORY OF EQUIPMENT WHICH INCLUDES PUMPS COMPRESSORS FANS GAS TURBINES ELECTRIC MOTORS INTERNAL COMBUSTION ENGINES AND OTHER EQUIPMENT THAT ARE CRITICAL TO THE EFFICIENT OPERATION OF PROCESS FACILITIES AROUND THE WORLD THESE MACHINES MUST BE DESIGNED TO MOVE GASES AND LIQUIDS SAFELY RELIABLY AND IN AN ENVIRONMENTALLY FRIENDLY MANNER TO FULLY UNDERSTAND ROTATING MACHINERY OWNERS MUST BE FAMILIAR WITH THEIR ASSOCIATED TECHNOLOGIES SUCH AS MACHINE DESIGN LUBRICATION FLUID DYNAMICS THERMODYNAMICS ROTORDYNAMICS VIBRATION ANALYSIS CONDITION MONITORING MAINTENANCE PRACTICES RELIABILITY THEORY AND OTHER TOPICS THE GOAL OF THE ADVANCES IN ROTATING MACHINERY BOOK SERIES IS TO PROVIDE INDUSTRY PRACTITIONERS A TIME SAVINGS MEANS OF LEARNING ABOUT THE MOST UP TO DATE ROTATING MACHINERY IDEAS AND BEST PRACTICES THIS THREE BOOK SERIES WILL COVER INDUSTRY RELEVANT TOPICS SUCH AS DESIGN ASSESSMENTS MODELING RELIABILITY IMPROVEMENTS MAINTENANCE METHODS AND BEST PRACTICES RELIABILITY AUDITS DATA COLLECTION DATA ANALYSIS CONDITION MONITORING AND MORE THIS FIRST VOLUME BEGINS THE SERIES BY FOCUSING ON ROTATING MACHINERY DESIGN ASSESSMENTS MODELING AND ANALYSIS AND RELIABILITY IMPROVEMENT IDEAS THIS BROAD COLLECTION OF CURRENT ROTATING MACHINERY TOPICS WRITTEN BY INDUSTRY EXPERTS IS A MUST HAVE FOR ROTATING EQUIPMENT ENGINEERS MAINTENANCE PERSONNEL STUDENTS AND ANYONE ELSE WANTING TO STAY ABREAST WITH CURRENT ROTATING MACHINERY CONCEPTS AND TECHNOLOGY DESIGN MODELING AND RELIABILITY IN ROTATING MACHINERY COVERS AMONG MANY OTHER TOPICS ROTORDYNAMICS AND TORSIONAL VIBRATION MODELING HYDRODYNAMIC BEARING DESIGN THEORY AND CURRENT PRACTICES CENTRIFUGAL AND RECIPROCATING COMPRESSOR DESIGN AND ANALYSIS CENTRIFUGAL PUMP DESIGN SELECTION AND MONITORING GENERAL PURPOSE STEAM TURBINE SIZING

THERE ARE GOOD REASONS WHY THE SUBJECT OF ELECTRIC POWER ENGINEERING AFTER MANY YEARS OF NEGLECT IS MAKING A COMEBACK IN THE UNDERGRADUATE CURRICULUM OF MANY ELECTRICAL ENGINEERING DEPARTMENTS THE MOST OBVIOUS IS THE CURRENT PUBLIC AWARENESS OF THE ENERGY CRISIS MORE FUNDAMENTAL IS THE CONCERN WITH SOCIAL RESPONSIBILITY AMONG COLLEGE STUDENTS IN GENERAL AND ENGINEERING STUDENTS IN PARTICULAR AFTER ALL ELECTRIC POWER REMAINS ONE OF THE CORNERSTONES OF OUR CIVILIZATION AND THE WELL PUBLICIZED PROBLEMS OF ECOLOGY ECONOMY SAFETY DEPENDABILITY AND NATURAL RESOURCES MANAGEMENT POSE EVER GROWING CHALLENGES TO THE BEST MINDS IN THE ENGINEERING COMMUNITY BEFORE AN ENGINEER CAN SUCCESSFULLY INVOLVE HIMSELF IN SUCH PROBLEMS HE MUST FIRST BE FAMILIAR WITH THE MAIN COMPONENTS OF ELECTRIC POWER SYSTEMS THIS TEXT BOOK WILL ASSIST HIM IN ACQUIRING THE NECESSARY FAMILIARITY THE COURSE FOR WHICH THIS BOOK IS MAINLY INTENDED CAN BE TAKEN BY ANY STUDENT WHO HAS HAD SOME CIRCUIT ANALYSIS USING DISCRETE ELEMENTS AND INCLUDING SINUSOIDAL STEADY STATE AND ELEMENTARY ELECTROMAGNETIC FIELD THEORY MOST STUDENTS TAKING THE COURSE WILL BE IN THEIR JUNIOR OR SENIOR YEARS ONCE THE COURSE IS COMPLETED STUDENTS MAY DECIDE TO GO MORE DEEPLY INTO THE DESIGN AND OPERATION OF THESE COMPONENTS AND STUDY THEM ON A MORE ADVANCED LEVEL OR THEY MAY DIRECT THEIR ATTENTION TO THE PROBLEMS OF THE SYSTEM ITSELF PROBLEMS WHICH ARE ONLY HINTED AT BRIEFLY AT VARIOUS POINTS HEREIN

ELECTRICAL MACHINES TARGETS THE UNDERGRADUATE STUDENTS OF ELECTRICAL MECHANICAL CIVIL AND ELECTRONICS INSTRUMENTATION ENGINEERING ETC THE BOOK DISCUSSES IN DETAIL ELECTROMAGNETIC SYSTEMS TRANSFORMERS DC MACHINES INDUCTION MACHINES SYNCHRONOUS MACHINES SPECIAL MOTORS AND GENERALIZED MACHINE THEORY IT INTRODUCES THE READERS TO THE PRINCIPLES TECHNIQUES AND

CURRENT TRENDS OF ELECTROMECHANICAL ENERGY CONVERSION EMEC DEVICES THE BOOK PROVIDES A STRONG FOUNDATION TO THE STUDENTS WHEN IT DEALS WITH IMPORTANT CONCEPTS SUCH AS CLASSES OF SQUIRREL CAGE MOTORS PERMANENT MAGNETIC MATERIALS AND THEIR APPLICATIONS POLYPHASE CIRCUITS AND SERVO MOTORS IN MANY CONTEMPORARY ELECTRICAL MACHINES ONE OF THE MOST SIGNIFICANT COMPONENTS IS POWER ELECTRONICS THE INVENTION OF SOLID STATE DEVICES AND EMBEDDED COMPUTING SYSTEMS HAS RESULTED IN THE DEVELOPMENT OF NEWER MOTORS OF MODERN ERA THE BOOK INCLUDES A BRIEF INTRODUCTION TO POWER ELECTRONICS AND MACHINE CONTROL A DISCUSSION ON SPEED AND TORQUE CHARACTERISTICS HAS ALSO BEEN MADE A PART OF THIS BOOK IT ALSO DEALS WITH THE RECENT DEVELOPMENTS IN ELECTRICAL MACHINES AREA OF RESEARCH LIKE ENERGY MACHINES ELECTROMAGNETS FOR CONTROLLED LEVITATION AND HYPERLOOP SYSTEM IT ENCOURAGES STUDENTS TO EXPLORE NEWER AREAS OF ELECTRICAL MACHINES AND LEARN SIMULATION SOFTWARE AND STATE OF ART FINITE ELEMENT ANALYSIS SOFTWARE

THIS BOOK EQUIPS THE READER TO UNDERSTAND EVERY IMPORTANT ASPECT OF THE DYNAMICS OF ROTATING MACHINES WILL THE VIBRATION BE LARGE WHAT INFLUENCES MACHINE STABILITY HOW CAN THE VIBRATION BE REDUCED WHICH SORTS OF ROTOR VIBRATION ARE THE WORST THE BOOK DEVELOPS THIS UNDERSTANDING INITIALLY USING EXTREMELY SIMPLE MODELS FOR EACH PHENOMENON IN WHICH AT MOST FOUR EQUATIONS CAPTURE THE BEHAVIOR MORE DETAILED MODELS ARE THEN DEVELOPED BASED ON FINITE ELEMENT ANALYSIS TO ENABLE THE ACCURATE SIMULATION OF THE RELEVANT PHENOMENA FOR REAL MACHINES ANALYSIS SOFTWARE IN MATLAB IS ASSOCIATED WITH THIS BOOK AND NOVICES TO ROTORDYNAMICS CAN EXPECT TO MAKE GOOD PREDICTIONS OF CRITICAL SPEEDS AND ROTATING MODE SHAPES WITHIN DAYS THE BOOK IS STRUCTURED MORE AS A LEARNING GUIDE THAN AS A REFERENCE TOME AND PROVIDES READERS WITH MORE THAN 100 WORKED EXAMPLES AND MORE THAN 100 PROBLEMS AND SOLUTIONS

IN ONE COMPLETE VOLUME THIS ESSENTIAL REFERENCE PRESENTS AN IN DEPTH OVERVIEW OF THE THEORETICAL PRINCIPLES AND TECHNIQUES OF ELECTRICAL MACHINE DESIGN THIS TIMELY NEW EDITION OFFERS UP TO DATE THEORY AND GUIDELINES FOR THE DESIGN OF ELECTRICAL MACHINES TAKING INTO ACCOUNT RECENT ADVANCES IN PERMANENT MAGNET MACHINES AS WELL AS SYNCHRONOUS RELUCTANCE MACHINES NEW COVERAGE INCLUDES BRAND NEW MATERIAL ON THE ECOLOGICAL IMPACT OF THE MOTORS COVERING THE ECO DESIGN PRINCIPLES OF ROTATING ELECTRICAL MACHINES AN EXPANDED SECTION ON THE DESIGN OF PERMANENT MAGNET SYNCHRONOUS MACHINES NOW REPORTING ON THE DESIGN OF TOOTH COIL HIGH TORQUE PERMANENT MAGNET MACHINES AND THEIR PROPERTIES LARGE UPDATES AND NEW MATERIAL ON SYNCHRONOUS RELUCTANCE MACHINES AIR GAP INDUCTANCE LOSSES IN AND RESISTIVITY OF PERMANENT MAGNETS PM OPERATING POINT OF LOADED PM CIRCUIT PM MACHINE DESIGN AND MINIMIZING THE LOSSES IN ELECTRICAL MACHINES END OF CHAPTER EXERCISES AND NEW DIRECT DESIGN EXAMPLES WITH METHODS AND SOLUTIONS TO REAL DESIGN PROBLEMS A SUPPLEMENTARY WEBSITE HOSTS TWO MACHINE DESIGN EXAMPLES CREATED WITH MATHCAD ROTOR SURFACE MAGNET PERMANENT MAGNET MACHINE AND SQUIRREL CAGE INDUCTION MACHINE CALCULATIONS ALSO A MATLAB CODE FOR OPTIMIZING THE DESIGN OF AN INDUCTION MOTOR IS PROVIDED OUTLINING A STEP BY STEP SEQUENCE OF MACHINE DESIGN THIS BOOK ENABLES ELECTRICAL MACHINE DESIGNERS TO DESIGN ROTATING ELECTRICAL MACHINES WITH A THOROUGH TREATMENT OF ALL EXISTING AND EMERGING TECHNOLOGIES IN THE FIELD IT IS A USEFUL MANUAL FOR PROFESSIONALS WORKING IN THE DIAGNOSIS OF ELECTRICAL MACHINES AND DRIVES A RIGOROUS INTRODUCTION TO THE THEORETICAL PRINCIPLES AND TECHNIQUES MAKES THE BOOK INVALUABLE TO SENIOR ELECTRICAL ENGINEERING STUDENTS POSTGRADUATES RESEARCHERS AND UNIVERSITY LECTURERS INVOLVED IN ELECTRICAL DRIVES TECHNOLOGY AND ELECTROMECHANICAL ENERGY CONVERSION

THIS BOOK PRIMARILY WRITTEN TO MEET THE NEEDS OF PRACTICING ENGINEERS IN A LARGE VARIETY OF INDUSTRIES WHERE RECIPROCATING MACHINES ARE USED ALTHOUGH ALL OF THE MATERIAL IS SUITABLE FOR COLLEGE UNDERGRADUATE LEVEL DESIGN ENGINEERING COURSES IT IS EXPECTED THAT THE READER IS FAMILIAR WITH BASIC TO MEDIUM LEVEL CALCULUS OFFERED AT THE COLLEGE UNDERGRADUATE LEVEL THE FIRST CHAPTER OF THE BOOK DEALS WITH CLASSICAL VIBRATION THEORY STARTING WITH A SINGLE DEGREE OF FREEDOM SYSTEM TO DEVELOP CONCEPTS OF DAMPING RESPONSE AND UNBALANCE THE SECOND CHAPTER DEALS WITH TYPES AND CLASSIFICATION OF RECIPROCATING MACHINES WHILE THE THIRD CHAPTER DISCUSSES DETAIL DESIGN ASPECTS OF MACHINE COMPONENTS THE FOURTH CHAPTER INTRODUCES THE DYNAMICS OF SLIDER AND CRANKS MECHANISM AND PROVIDES EXPLANATION OF THE PURPOSE AND MOTION OF VARIOUS COMPONENTS THE FIFTH CHAPTER LOOKS INTO DYNAMIC FORCES CREATED IN THE SYSTEM AND METHODS TO BALANCE GAS PRESSURE AND INERTIA LOADS THE SIXTH CHAPTER EXPLAINS THE TORSIONAL VIBRATION THEORY AND LOOKS AT THE DIFFERENT VARIABLES ASSOCIATED WITH IT CHAPTER SEVEN ANALYZES FLEXURAL VIBRATIONS AND LATERAL CRITICAL SPEED CONCEPTS TOGETHER WITH JOURNAL BEARINGS AND THEIR IMPACT ON A ROTATING SYSTEM ADVANCED ANALYTICAL TECHNIQUES TO DETERMINE DYNAMIC CHARACTERISTICS OF ALL MAJOR COMPONENTS OF RECIPROCATING MACHINERY ARE PRESENTED IN CHAPTER EIGHT METHODS TO MITIGATE TORSIONAL VIBRATIONS IN A CRANKSHAFT USING ABSORBERS ARE ANALYZED IN CLOSE DETAIL VARIOUS MECHANISMS OF FLEXURAL EXCITATION SOURCES AND THEIR RESPONSE ON A ROTOR BEARING SYSTEM ARE EXPLORED STABILITY OF A ROTOR AND DIFFERENT DESTABILIZING MECHANISMS ARE ALSO INCLUDED IN THIS CHAPTER TECHNIQUES IN VIBRATION MEASUREMENT AND BALANCING OF RECIPROCATING AND ROTATING SYSTEMS ARE PRESENTED IN CHAPTER NINE CHAPTER

TEN LOOKS AT COMPUTATIONAL FLUID DYNAMICS ASPECTS OF FLOW THROUGH INTAKE AND EXHAUST MANIFOLDS AS WELL AS FLUID FLOW INDUCED COMPONENT VIBRATIONS CHAPTER ELEVEN EXTENDS THIS DISCUSSION TO PRESSURE PULSATIONS IN PIPING ATTACHED TO RECIPROCATING PUMPS AND COMPRESSORS CHAPTER TWELVE CONSIDERS THE INTERACTION BETWEEN THE STRUCTURAL DYNAMICS OF COMPONENTS AND NOISE TOGETHER WITH METHODS TO IMPROVE SOUND QUALITY OPTIMIZED DESIGN OF COMPONENTS OF RECIPROCATING MACHINERY FOR SPECIFIED PARAMETERS AND SET TARGET VALUES IS INVESTIGATED AT LENGTH IN CHAPTER THIRTEEN PRACTICING ENGINEERS INTERESTED IN APPLYING THE THEORETICAL MODEL TO THEIR OWN OPERATING SYSTEM WILL FIND CASE HISTORIES SHOWN IN CHAPTER FOURTEEN USEFUL

REDUCING AND CONTROLLING THE LEVEL OF VIBRATION IN A MECHANICAL SYSTEM LEADS TO AN IMPROVED WORK ENVIRONMENT AND PRODUCT QUALITY REDUCED NOISE MORE ECONOMICAL OPERATION AND LONGER EQUIPMENT LIFE ADEQUATE DESIGN IS ESSENTIAL FOR REDUCING VIBRATIONS WHILE DAMPING AND CONTROL METHODS HELP FURTHER REDUCE AND MANIPULATE VIBRATIONS WHEN DESIGN STRAT

MAINTENANCE RELIABILITY AND TROUBLESHOOTING IN ROTATING MACHINERY THIS BROAD COLLECTION OF CURRENT ROTATING MACHINERY TOPICS WRITTEN BY INDUSTRY EXPERTS IS A MUST HAVE FOR ROTATING EQUIPMENT ENGINEERS MAINTENANCE PERSONNEL STUDENTS AND ANYONE ELSE WANTING TO STAY ABREAST WITH CURRENT ROTATING MACHINERY CONCEPTS AND TECHNOLOGY ROTATING MACHINERY REPRESENTS A BROAD CATEGORY OF EQUIPMENT WHICH INCLUDES PUMPS COMPRESSORS FANS GAS TURBINES ELECTRIC MOTORS INTERNAL COMBUSTION ENGINES AND OTHER EQUIPMENT THAT ARE CRITICAL TO THE EFFICIENT OPERATION OF PROCESS FACILITIES AROUND THE WORLD THESE MACHINES MUST BE DESIGNED TO MOVE GASES AND LIQUIDS SAFELY RELIABLY AND IN AN ENVIRONMENTALLY FRIENDLY MANNER TO FULLY UNDERSTAND ROTATING MACHINERY OWNERS MUST BE FAMILIAR WITH THEIR ASSOCIATED TECHNOLOGIES SUCH AS MACHINE DESIGN LUBRICATION FLUID DYNAMICS THERMODYNAMICS ROTORDYNAMICS VIBRATION ANALYSIS CONDITION MONITORING MAINTENANCE PRACTICES RELIABILITY THEORY AND OTHER TOPICS THE GOAL OF THE ADVANCES IN ROTATING MACHINERY BOOK SERIES IS TO PROVIDE INDUSTRY PRACTITIONERS A TIME SAVINGS MEANS OF LEARNING ABOUT THE MOST UP TO DATE ROTATING MACHINERY IDEAS AND BEST PRACTICES THIS THREE BOOK SERIES WILL COVER INDUSTRY RELEVANT TOPICS SUCH AS DESIGN ASSESSMENTS MODELING RELIABILITY IMPROVEMENTS MAINTENANCE METHODS AND BEST PRACTICES RELIABILITY AUDITS DATA COLLECTION DATA ANALYSIS CONDITION MONITORING AND MORE VOLUME ONE BEGAN THE SERIES BY FOCUSING ON DESIGN AND ANALYSIS VOLUME TWO CONTINUES THE SERIES BY COVERING IMPORTANT MACHINERY RELIABILITY CONCEPTS AND OFFERING PRACTICAL RELIABILITY IMPROVEMENT IDEAS BEST IN CLASS PRODUCTION FACILITIES REQUIRE EXCEPTIONAL MACHINERY RELIABILITY PERFORMANCE IN THIS VOLUME EXCEPTIONAL MACHINERY RELIABILITY IS DEFINED AS THE ABILITY OF CRITICAL ROTATING MACHINES TO CONSISTENTLY PERFORM AS DESIGNED WITHOUT DEGRADATION OR FAILURE UNTIL THEIR NEXT SCHEDULED OVERHAUL READERS WILL FIND THIS VOLUME CHOCK FULL OF PRACTICAL IDEAS THEY CAN USE TO IMPROVE THE RELIABILITY AND EFFICIENCY OF THEIR MACHINERY MAINTENANCE RELIABILITY AND TROUBLESHOOTING IN ROTATING MACHINERY COVERS AMONG MANY OTHER TOPICS GENERAL MACHINERY RELIABILITY ADVICE UNDERSTANDING FAILURE DATA DESIGN AUDITS AND IMPROVEMENT IDEAS MAINTENANCE BEST PRACTICES ANALYZING FAILURES

THIS BOOK CONSISTS OF 113 SELECTED PAPERS PRESENTED AT THE 2015 INTERNATIONAL CONFERENCE ON MECHANICAL ENGINEERING AND CONTROL SYSTEMS MECS2015 WHICH WAS HELD IN WUHAN CHINA DURING JANUARY 23 25 2015 ALL ACCEPTED PAPERS HAVE BEEN SUBJECTED TO STRICT PEER REVIEW BY TWO TO FOUR EXPERT REFEREES AND SELECTED BASED ON ORIGINALITY ABILITY TO TEST IDEAS AND CONTRIBUTION TO KNOWLEDGE MECS2015 FOCUSES ON EIGHT MAIN AREAS NAMELY MECHANICAL ENGINEERING AUTOMATION COMPUTER NETWORKS SIGNAL PROCESSING PATTERN RECOGNITION AND ARTIFICIAL INTELLIGENCE ELECTRICAL ENGINEERING MATERIAL ENGINEERING AND SYSTEM DESIGN THE CONFERENCE PROVIDED AN OPPORTUNITY FOR RESEARCHERS TO EXCHANGE IDEAS AND APPLICATION EXPERIENCES AND TO ESTABLISH BUSINESS OR RESEARCH RELATIONS FINDING GLOBAL PARTNERS FOR FUTURE COLLABORATIONS THE CONFERENCE PROGRAM WAS EXTREMELY RICH PROFOUND AND FEATURED HIGH IMPACT PRESENTATIONS OF SELECTED PAPERS AND ADDITIONAL LATE BREAKING CONTRIBUTIONS

GATHERING THE PROCEEDINGS OF THE 2018 INTELLIGENT SYSTEMS CONFERENCE INTELLISYS 2018 THIS BOOK OFFERS A REMARKABLE COLLECTION OF CHAPTERS COVERING A WIDE RANGE OF TOPICS IN INTELLIGENT SYSTEMS AND COMPUTING AND THEIR REAL WORLD APPLICATIONS THE CONFERENCE ATTRACTED A TOTAL OF 568 SUBMISSIONS FROM PIONEERING RESEARCHERS SCIENTISTS INDUSTRIAL ENGINEERS AND STUDENTS FROM ALL AROUND THE WORLD THESE SUBMISSIONS UNDERWENT A DOUBLE BLIND PEER REVIEW PROCESS AFTER WHICH 194 INCLUDING 13 POSTER PAPERS WERE SELECTED TO BE INCLUDED IN THESE PROCEEDINGS AS INTELLIGENT SYSTEMS CONTINUE TO REPLACE AND SOMETIMES OUTPERFORM HUMAN INTELLIGENCE IN DECISION MAKING PROCESSES THEY HAVE MADE IT POSSIBLE TO TACKLE MANY PROBLEMS MORE EFFECTIVELY THIS BRANCHING OUT OF COMPUTATIONAL INTELLIGENCE IN SEVERAL DIRECTIONS AND THE USE OF INTELLIGENT SYSTEMS IN EVERYDAY APPLICATIONS HAVE CREATED THE NEED FOR SUCH AN INTERNATIONAL CONFERENCE WHICH SERVES AS A VENUE FOR REPORTING ON CUTTING EDGE INNOVATIONS AND DEVELOPMENTS THIS BOOK COLLECTS BOTH THEORY AND APPLICATION BASED CHAPTERS

ON ALL ASPECTS OF ARTIFICIAL INTELLIGENCE FROM CLASSICAL TO INTELLIGENT SCOPE READERS ARE SURE TO FIND THE BOOK BOTH INTERESTING AND VALUABLE AS IT PRESENTS STATE OF THE ART INTELLIGENT METHODS AND TECHNIQUES FOR SOLVING REAL WORLD PROBLEMS ALONG WITH A VISION OF FUTURE RESEARCH DIRECTIONS

RIGHT HERE, WE HAVE COUNTLESS BOOK **ELECTRICAL TRANSFORMERS AND ROTATING MACHINES** AND COLLECTIONS TO CHECK OUT. WE ADDITIONALLY PROVIDE VARIANT TYPES AND PLUS TYPE OF THE BOOKS TO BROWSE. THE AGREEABLE BOOK, FICTION, HISTORY, NOVEL, SCIENTIFIC RESEARCH, AS CAPABLY AS VARIOUS NEW SORTS OF BOOKS ARE READILY AFFABLE HERE. AS THIS ELECTRICAL TRANSFORMERS AND ROTATING MACHINES, IT ENDS UP INBORN ONE OF THE FAVORED EBOOK ELECTRICAL TRANSFORMERS AND ROTATING MACHINES COLLECTIONS THAT WE HAVE. THIS IS WHY YOU REMAIN IN THE BEST WEBSITE TO LOOK THE UNBELIEVABLE BOOKS TO HAVE.

1. WHERE CAN I BUY ELECTRICAL TRANSFORMERS AND ROTATING MACHINES BOOKS? BOOKSTORES: PHYSICAL BOOKSTORES LIKE BARNES & NOBLE, WATERSTONES, AND INDEPENDENT LOCAL STORES. ONLINE RETAILERS: AMAZON, BOOK DEPOSITORY, AND VARIOUS ONLINE BOOKSTORES PROVIDE A BROAD SELECTION OF BOOKS IN PHYSICAL AND DIGITAL FORMATS.
2. WHAT ARE THE DIVERSE BOOK FORMATS AVAILABLE? WHICH KINDS OF BOOK FORMATS ARE CURRENTLY AVAILABLE? ARE THERE MULTIPLE BOOK FORMATS TO CHOOSE FROM? HARDCOVER: ROBUST AND LONG-LASTING, USUALLY PRICIER. PAPERBACK: LESS COSTLY, LIGHTER, AND MORE PORTABLE THAN HARDCOVERS. E-BOOKS: DIGITAL BOOKS ACCESSIBLE FOR E-READERS LIKE KINDLE OR THROUGH PLATFORMS SUCH AS APPLE BOOKS, KINDLE, AND GOOGLE PLAY BOOKS.
3. SELECTING THE PERFECT ELECTRICAL TRANSFORMERS AND ROTATING MACHINES BOOK: GENRES: CONSIDER THE GENRE YOU ENJOY (NOVELS, NONFICTION, MYSTERY, SCI-FI, ETC.). RECOMMENDATIONS: ASK FOR ADVICE FROM FRIENDS, PARTICIPATE IN BOOK CLUBS, OR BROWSE THROUGH ONLINE REVIEWS AND SUGGESTIONS. AUTHOR: IF YOU FAVOR A SPECIFIC AUTHOR, YOU MIGHT ENJOY MORE OF THEIR WORK.
4. WHAT’S THE BEST WAY TO MAINTAIN ELECTRICAL TRANSFORMERS AND ROTATING MACHINES BOOKS? STORAGE: STORE THEM AWAY FROM DIRECT SUNLIGHT AND IN A DRY SETTING. HANDLING: PREVENT FOLDING PAGES, UTILIZE BOOKMARKS, AND HANDLE THEM WITH CLEAN HANDS. CLEANING: OCCASIONALLY DUST THE COVERS AND PAGES GENTLY.
5. CAN I BORROW BOOKS WITHOUT BUYING THEM? LOCAL LIBRARIES: REGIONAL LIBRARIES OFFER A DIVERSE SELECTION OF BOOKS FOR BORROWING. BOOK SWAPS: LOCAL BOOK EXCHANGE OR WEB PLATFORMS WHERE PEOPLE EXCHANGE BOOKS.
6. HOW CAN I TRACK MY READING PROGRESS OR MANAGE MY BOOK CLIELECTION? BOOK TRACKING APPS: GOODREADS ARE POPOLAR APPS FOR TRACKING YOUR READING PROGRESS AND MANAGING BOOK CLIELECTIONS. SPREADSHEETS: YOU CAN CREATE YOUR OWN SPREADSHEET TO TRACK BOOKS READ, RATINGS, AND OTHER DETAILS.
7. WHAT ARE ELECTRICAL TRANSFORMERS AND ROTATING MACHINES AUDIOBOOKS, AND WHERE CAN I FIND THEM?

- AUDIOBOOKS: AUDIO RECORDINGS OF BOOKS, PERFECT FOR LISTENING WHILE COMMUTING OR MOLTITASKING. PLATFORMS: AUDIBLE OFFER A WIDE SELECTION OF AUDIOBOOKS.
8. HOW DO I SUPPORT AUTHORS OR THE BOOK INDUSTRY? BUY BOOKS: PURCHASE BOOKS FROM AUTHORS OR INDEPENDENT BOOKSTORES. REVIEWS: LEAVE REVIEWS ON PLATFORMS LIKE AMAZON. PROMOTION: SHARE YOUR FAVORITE BOOKS ON SOCIAL MEDIA OR RECOMMEND THEM TO FRIENDS.
  9. ARE THERE BOOK CLUBS OR READING COMMUNITIES I CAN JOIN? LOCAL CLUBS: CHECK FOR LOCAL BOOK CLUBS IN LIBRARIES OR COMMUNITY CENTERS. ONLINE COMMUNITIES: PLATFORMS LIKE BOOKBUB HAVE VIRTUAL BOOK CLUBS AND DISCUSSION GROUPS.
  10. CAN I READ ELECTRICAL TRANSFORMERS AND ROTATING MACHINES BOOKS FOR FREE? PUBLIC DOMAIN BOOKS: MANY CLASSIC BOOKS ARE AVAILABLE FOR FREE AS THEYRE IN THE PUBLIC DOMAIN.

FREE E-BOOKS: SOME WEBSITES OFFER FREE E-BOOKS LEGALLY, LIKE PROJECT GUTENBERG OR OPEN LIBRARY. FIND ELECTRICAL TRANSFORMERS AND ROTATING MACHINES

INTRODUCTION

THE DIGITAL AGE HAS REVOLUTIONIZED THE WAY WE READ, MAKING BOOKS MORE ACCESSIBLE THAN EVER. WITH THE RISE OF EBOOKS, READERS CAN NOW CARRY ENTIRE LIBRARIES IN THEIR POCKETS. AMONG THE VARIOUS SOURCES FOR EBOOKS, FREE EBOOK SITES HAVE EMERGED AS A POPULAR CHOICE. THESE SITES OFFER A TREASURE TROVE OF KNOWLEDGE AND ENTERTAINMENT WITHOUT THE COST. BUT WHAT MAKES THESE SITES SO VALUABLE, AND WHERE CAN YOU FIND THE BEST ONES? LET’S DIVE INTO THE WORLD OF FREE EBOOK SITES.

BENEFITS OF FREE EBOOK SITES

WHEN IT COMES TO READING, FREE EBOOK SITES OFFER NUMEROUS ADVANTAGES.

COST SAVINGS

FIRST AND FOREMOST, THEY SAVE YOU MONEY. BUYING BOOKS CAN BE EXPENSIVE, ESPECIALLY IF YOU’RE AN AVID READER. FREE EBOOK SITES ALLOW YOU TO ACCESS A VAST ARRAY OF BOOKS WITHOUT SPENDING A DIME.

## ACCESSIBILITY

THESE SITES ALSO ENHANCE ACCESSIBILITY. WHETHER YOU'RE AT HOME, ON THE GO, OR HALFWAY AROUND THE WORLD, YOU CAN ACCESS YOUR FAVORITE TITLES ANYTIME, ANYWHERE, PROVIDED YOU HAVE AN INTERNET CONNECTION.

## VARIETY OF CHOICES

MOREOVER, THE VARIETY OF CHOICES AVAILABLE IS ASTOUNDING. FROM CLASSIC LITERATURE TO CONTEMPORARY NOVELS, ACADEMIC TEXTS TO CHILDREN'S BOOKS, FREE EBOOK SITES COVER ALL GENRES AND INTERESTS.

## TOP FREE EBOOK SITES

THERE ARE COUNTLESS FREE EBOOK SITES, BUT A FEW STAND OUT FOR THEIR QUALITY AND RANGE OF OFFERINGS.

### PROJECT GUTENBERG

PROJECT GUTENBERG IS A PIONEER IN OFFERING FREE EBOOKS. WITH OVER 60,000 TITLES, THIS SITE PROVIDES A WEALTH OF CLASSIC LITERATURE IN THE PUBLIC DOMAIN.

### OPEN LIBRARY

OPEN LIBRARY AIMS TO HAVE A WEBPAGE FOR EVERY BOOK EVER PUBLISHED. IT OFFERS MILLIONS OF FREE EBOOKS, MAKING IT A FANTASTIC RESOURCE FOR READERS.

### GOOGLE BOOKS

GOOGLE BOOKS ALLOWS USERS TO SEARCH AND PREVIEW MILLIONS OF BOOKS FROM LIBRARIES AND PUBLISHERS WORLDWIDE. WHILE NOT ALL BOOKS ARE AVAILABLE FOR FREE, MANY ARE.

### MANYBOOKS

MANYBOOKS OFFERS A LARGE SELECTION OF FREE EBOOKS IN VARIOUS GENRES. THE SITE IS USER-

FRIENDLY AND OFFERS BOOKS IN MULTIPLE FORMATS.

### BOOKBOON

BOOKBOON SPECIALIZES IN FREE TEXTBOOKS AND BUSINESS BOOKS, MAKING IT AN EXCELLENT RESOURCE FOR STUDENTS AND PROFESSIONALS.

## HOW TO DOWNLOAD EBOOKS SAFELY

DOWNLOADING EBOOKS SAFELY IS CRUCIAL TO AVOID PIRATED CONTENT AND PROTECT YOUR DEVICES.

### AVOIDING PIRATED CONTENT

STICK TO REPUTABLE SITES TO ENSURE YOU'RE NOT DOWNLOADING PIRATED CONTENT. PIRATED EBOOKS NOT ONLY HARM AUTHORS AND PUBLISHERS BUT CAN ALSO POSE SECURITY RISKS.

### ENSURING DEVICE SAFETY

ALWAYS USE ANTIVIRUS SOFTWARE AND KEEP YOUR DEVICES UPDATED TO PROTECT AGAINST MALWARE THAT CAN BE HIDDEN IN DOWNLOADED FILES.

## LEGAL CONSIDERATIONS

BE AWARE OF THE LEGAL CONSIDERATIONS WHEN DOWNLOADING EBOOKS. ENSURE THE SITE HAS THE RIGHT TO DISTRIBUTE THE BOOK AND THAT YOU'RE NOT VIOLATING COPYRIGHT LAWS.

## USING FREE EBOOK SITES FOR EDUCATION

FREE EBOOK SITES ARE INVALUABLE FOR EDUCATIONAL PURPOSES.

## ACADEMIC RESOURCES

SITES LIKE PROJECT GUTENBERG AND OPEN LIBRARY OFFER NUMEROUS ACADEMIC RESOURCES, INCLUDING TEXTBOOKS AND SCHOLARLY ARTICLES.

## LEARNING NEW SKILLS

YOU CAN ALSO FIND BOOKS ON VARIOUS SKILLS, FROM COOKING TO PROGRAMMING, MAKING THESE SITES GREAT FOR PERSONAL DEVELOPMENT.

## SUPPORTING HOMESCHOOLING

FOR HOMESCHOOLING PARENTS, FREE EBOOK SITES PROVIDE A WEALTH OF EDUCATIONAL MATERIALS FOR DIFFERENT GRADE LEVELS AND SUBJECTS.

## GENRES AVAILABLE ON FREE EBOOK SITES

THE DIVERSITY OF GENRES AVAILABLE ON FREE EBOOK SITES ENSURES THERE'S SOMETHING FOR EVERYONE.

### FICTION

FROM TIMELESS CLASSICS TO CONTEMPORARY BESTSELLERS, THE FICTION SECTION IS BRIMMING WITH OPTIONS.

### NON-FICTION

NON-FICTION ENTHUSIASTS CAN FIND BIOGRAPHIES, SELF-HELP BOOKS, HISTORICAL TEXTS, AND MORE.

### TEXTBOOKS

STUDENTS CAN ACCESS TEXTBOOKS ON A WIDE RANGE OF SUBJECTS, HELPING REDUCE THE FINANCIAL BURDEN OF EDUCATION.

### CHILDREN'S BOOKS

PARENTS AND TEACHERS CAN FIND A PLETHORA OF CHILDREN'S BOOKS, FROM PICTURE BOOKS TO YOUNG ADULT NOVELS.

## ACCESSIBILITY FEATURES OF EBOOK SITES

EBOOK SITES OFTEN COME WITH FEATURES THAT ENHANCE ACCESSIBILITY.

### AUDIOBOOK OPTIONS

MANY SITES OFFER AUDIOBOOKS, WHICH ARE GREAT FOR THOSE WHO PREFER LISTENING TO READING.

### ADJUSTABLE FONT SIZES

YOU CAN ADJUST THE FONT SIZE TO SUIT YOUR READING COMFORT, MAKING IT EASIER FOR THOSE WITH VISUAL IMPAIRMENTS.

### TEXT-TO-SPEECH CAPABILITIES

TEXT-TO-SPEECH FEATURES CAN CONVERT WRITTEN TEXT INTO AUDIO, PROVIDING AN ALTERNATIVE WAY TO ENJOY BOOKS.

## TIPS FOR MAXIMIZING YOUR EBOOK EXPERIENCE

TO MAKE THE MOST OUT OF YOUR EBOOK READING EXPERIENCE, CONSIDER THESE TIPS.

### CHOOSING THE RIGHT DEVICE

WHETHER IT'S A TABLET, AN E-READER, OR A SMARTPHONE, CHOOSE A DEVICE THAT OFFERS A COMFORTABLE READING EXPERIENCE FOR YOU.

### ORGANIZING YOUR EBOOK LIBRARY

USE TOOLS AND APPS TO ORGANIZE YOUR EBOOK COLLECTION, MAKING IT EASY TO FIND AND ACCESS YOUR FAVORITE TITLES.

## SYNCING ACROSS DEVICES

MANY EBOOK PLATFORMS ALLOW YOU TO SYNC YOUR LIBRARY ACROSS MULTIPLE DEVICES, SO YOU CAN PICK UP RIGHT WHERE YOU LEFT OFF, NO MATTER WHICH DEVICE YOU'RE USING.

## CHALLENGES AND LIMITATIONS

DESPITE THE BENEFITS, FREE EBOOK SITES COME WITH CHALLENGES AND LIMITATIONS.

## QUALITY AND AVAILABILITY OF TITLES

NOT ALL BOOKS ARE AVAILABLE FOR FREE, AND SOMETIMES THE QUALITY OF THE DIGITAL COPY CAN BE POOR.

## DIGITAL RIGHTS MANAGEMENT (DRM)

DRM CAN RESTRICT HOW YOU USE THE EBOOKS YOU DOWNLOAD, LIMITING SHARING AND TRANSFERRING BETWEEN DEVICES.

## INTERNET DEPENDENCY

ACCESSING AND DOWNLOADING EBOOKS REQUIRES AN INTERNET CONNECTION, WHICH CAN BE A LIMITATION IN AREAS WITH POOR CONNECTIVITY.

## FUTURE OF FREE EBOOK SITES

THE FUTURE LOOKS PROMISING FOR FREE EBOOK SITES AS TECHNOLOGY CONTINUES TO ADVANCE.

## TECHNOLOGICAL ADVANCES

IMPROVEMENTS IN TECHNOLOGY WILL LIKELY MAKE ACCESSING AND READING EBOOKS EVEN MORE

SEAMLESS AND ENJOYABLE.

## EXPANDING ACCESS

EFFORTS TO EXPAND INTERNET ACCESS GLOBALLY WILL HELP MORE PEOPLE BENEFIT FROM FREE EBOOK SITES.

## ROLE IN EDUCATION

AS EDUCATIONAL RESOURCES BECOME MORE DIGITIZED, FREE EBOOK SITES WILL PLAY AN INCREASINGLY VITAL ROLE IN LEARNING.

## CONCLUSION

IN SUMMARY, FREE EBOOK SITES OFFER AN INCREDIBLE OPPORTUNITY TO ACCESS A WIDE RANGE OF BOOKS WITHOUT THE FINANCIAL BURDEN. THEY ARE INVALUABLE RESOURCES FOR READERS OF ALL AGES AND INTERESTS, PROVIDING EDUCATIONAL MATERIALS, ENTERTAINMENT, AND ACCESSIBILITY FEATURES. SO WHY NOT EXPLORE THESE SITES AND DISCOVER THE WEALTH OF KNOWLEDGE THEY OFFER?

## FAQs

ARE FREE EBOOK SITES LEGAL? YES, MOST FREE EBOOK SITES ARE LEGAL. THEY TYPICALLY OFFER BOOKS THAT ARE IN THE PUBLIC DOMAIN OR HAVE THE RIGHTS TO DISTRIBUTE THEM. HOW DO I KNOW IF AN EBOOK SITE IS SAFE? STICK TO WELL-KNOWN AND REPUTABLE SITES LIKE PROJECT GUTENBERG, OPEN LIBRARY, AND GOOGLE BOOKS. CHECK REVIEWS AND ENSURE THE SITE HAS PROPER SECURITY MEASURES. CAN I DOWNLOAD EBOOKS TO ANY DEVICE? MOST FREE EBOOK SITES OFFER DOWNLOADS IN MULTIPLE FORMATS, MAKING THEM COMPATIBLE WITH VARIOUS DEVICES LIKE E-READERS, TABLETS, AND SMARTPHONES. DO FREE EBOOK SITES OFFER AUDIOBOOKS? MANY FREE EBOOK SITES OFFER AUDIOBOOKS, WHICH ARE PERFECT FOR THOSE WHO PREFER LISTENING TO THEIR BOOKS. HOW CAN I SUPPORT AUTHORS IF I USE FREE EBOOK SITES? YOU CAN SUPPORT AUTHORS BY PURCHASING THEIR BOOKS WHEN POSSIBLE, LEAVING REVIEWS, AND SHARING THEIR WORK WITH OTHERS.



