## COMMUNICATION ENGINEERING CHITODE

COMMUNICATION ENGINEERING CHITODE COMMUNICATION ENGINEERING CHITODE MASTERING THE ART OF Information Flow Communication Engineering Chitode delves into the captivating realm of COMMUNICATION SYSTEMS OFFERING A COMPREHENSIVE AND ENGAGING EXPLORATION OF THE PRINCIPLES TECHNOLOGIES AND APPLICATIONS THAT UNDERPIN THE SEAMLESS FLOW OF INFORMATION IN OUR MODERN WORLD THIS BOOK AUTHORED BY AUTHOR NAME GUIDES READERS THROUGH THE INTRICATE WORKINGS OF COMMUNICATION NETWORKS FROM THE FOUNDATIONAL CONCEPTS OF SIGNAL PROCESSING AND MODULATION TO THE CUTTINGEDGE ADVANCEMENTS IN WIRELESS COMMUNICATION AND OPTICAL FIBER TECHNOLOGIES COMMUNICATION ENGINEERING TELECOMMUNICATIONS SIGNAL PROCESSING MODULATION WIRELESS COMMUNICATION OPTICAL FIBER NETWORK DESIGN INFORMATION THEORY DATA TRANSMISSION COMMUNICATION SYSTEMS CHITODE THIS BOOK PROVIDES A COMPREHENSIVE OVERVIEW OF COMMUNICATION ENGINEERING ENCOMPASSING BOTH THEORETICAL FOUNDATIONS AND PRACTICAL APPLICATIONS COMMUNICATION ENGINEERING CHITODE CATERS TO A DIVERSE AUDIENCE INCLUDING STUDENTS PROFESSIONALS AND ENTHUSIASTS SEEKING A THOROUGH UNDERSTANDING OF THE FIELD KEY FEATURES INCLUDE CLEAR AND CONCISE EXPLANATIONS COMPLEX CONCEPTS ARE PRESENTED IN AN ACCESSIBLE MANNER USING CLEAR LANGUAGE AND ILLUSTRATIVE EXAMPLES TO ENSURE COMPREHENSION REALWORLD APPLICATIONS THE BOOK INTEGRATES REALWORLD APPLICATIONS AND CASE STUDIES TO DEMONSTRATE THE RELEVANCE AND IMPACT OF COMMUNICATION ENGINEERING IN VARIOUS INDUSTRIES INDEPTH COVERAGE COMMUNICATION ENGINEERING CHITODE EXPLORES A WIDE RANGE OF TOPICS COVERING TRADITIONAL AND EMERGING TECHNOLOGIES AND EQUIPPING READERS WITH A HOLISTIC UNDERSTANDING OF THE FIELD PROBLEMSOLVING APPROACH INTERACTIVE EXERCISES AND PROBLEM SETS ARE INCORPORATED THROUGHOUT THE BOOK ENCOURAGING ACTIVE LEARNING AND FOSTERING CRITICAL THINKING SKILLS CONCLUSION IN AN ERA WHERE INFORMATION REIGNS SUPREME COMMUNICATION ENGINEERING STANDS AS A CRITICAL ENABLER OF PROGRESS COMMUNICATION ENGINEERING CHITODE EMPOWERS READERS TO NOT ONLY UNDERSTAND THE FUNDAMENTAL PRINCIPLES BUT ALSO TO NAVIGATE THE DYNAMIC LANDSCAPE OF 2 COMMUNICATION TECHNOLOGIES PAVING THE WAY FOR INNOVATION AND SHAPING THE FUTURE OF INFORMATION FLOW AS TECHNOLOGY CONTINUES TO EVOLVE AT AN UNPRECEDENTED PACE THE INSIGHTS GAINED FROM THIS BOOK WILL REMAIN RELEVANT AND INVALUABLE FOSTERING A DEEPER APPRECIATION FOR THE VITAL ROLE COMMUNICATION PLAYS IN OUR INTERCONNECTED WORLD FAQS 1 WHAT IS THE TARGET AUDIENCE FOR THIS BOOK COMMUNICATION ENGINEERING CHITODE IS DESIGNED FOR A DIVERSE AUDIENCE INCLUDING UNDERGRADUATE AND POSTGRADUATE STUDENTS THE BOOK PROVIDES A COMPREHENSIVE RESOURCE FOR STUDENTS PURSUING DEGREES IN ELECTRICAL ENGINEERING COMPUTER SCIENCE OR RELATED FIELDS PROFESSIONALS IN THE TELECOMMUNICATIONS INDUSTRY ENGINEERS NETWORK DESIGNERS AND TECHNICIANS WILL FIND VALUABLE INSIGHTS AND PRACTICAL APPLICATIONS WITHIN THE BOOK ANYONE INTERESTED IN LEARNING ABOUT COMMUNICATION TECHNOLOGIES THE BOOKS CLEAR EXPLANATIONS AND ENGAGING PRESENTATION MAKE IT ACCESSIBLE TO ANYONE WITH A CURIOUS MIND AND A DESIRE TO UNDERSTAND THE FUNDAMENTALS OF communication engineering 2 What are the key benefits of studying communication engineering COMMUNICATION ENGINEERING OFFERS A WIDE RANGE OF CAREER OPPORTUNITIES AND BENEFITS HIGH DEMAND THE TELECOMMUNICATIONS INDUSTRY IS CONSTANTLY GROWING CREATING A STEADY DEMAND FOR SKILLED COMMUNICATION ENGINEERS INNOVATIVE FIELD COMMUNICATION ENGINEERING INVOLVES WORKING WITH CUTTINGEDGE TECHNOLOGIES PUSHING THE BOUNDARIES OF INNOVATION GLOBAL IMPACT COMMUNICATION SYSTEMS CONNECT PEOPLE AND BUSINESSES WORLDWIDE ALLOWING YOU TO CONTRIBUTE TO A GLOBAL NETWORK INTELLECTUAL STIMULATION THE FIELD OFFERS INTELLECTUAL CHALLENGES AND THE OPPORTUNITY TO SOLVE COMPLEX PROBLEMS 3 WHAT ARE THE KEY TOPICS COVERED IN THE BOOK COMMUNICATION ENGINEERING CHITODE PROVIDES A COMPREHENSIVE OVERVIEW OF COMMUNICATION ENGINEERING INCLUDING SIGNAL Processing Fundamentals of signal analysis filtering and digital signal processing Modulation AND DEMODULATION TECHNIQUES FOR ENCODING AND DECODING INFORMATION ONTO CARRIER SIGNALS WIRELESS

COMMUNICATION PRINCIPLES AND TECHNOLOGIES OF CELLULAR NETWORKS WIFI BLUETOOTH AND SATELLITE COMMUNICATION 3 OPTICAL FIBER COMMUNICATION THE PHYSICS AND APPLICATIONS OF OPTICAL FIBER TRANSMISSION SYSTEMS NETWORK DESIGN PRINCIPLES OF NETWORK ARCHITECTURE ROUTING PROTOCOLS AND NETWORK MANAGEMENT INFORMATION THEORY MATHEMATICAL FOUNDATIONS OF INFORMATION TRANSMISSION AND CHANNEL CAPACITY DATA TRANSMISSION TECHNIQUES FOR EFFICIENT AND RELIABLE DATA TRANSMISSION OVER COMMUNICATION CHANNELS 4 HOW IS THIS BOOK DIFFERENT FROM OTHER COMMUNICATION ENGINEERING TEXTBOOKS COMMUNICATION ENGINEERING CHITODE DISTINGUISHES ITSELF FROM OTHER TEXTBOOKS BY ENGAGING AND ACCESSIBLE WRITING STYLE THE BOOK USES CLEAR AND CONCISE LANGUAGE MAKING COMPLEX CONCEPTS UNDERSTANDABLE EMPHASIS ON PRACTICAL APPLICATIONS THE BOOK INTEGRATES REALWORLD EXAMPLES AND CASE STUDIES DEMONSTRATING THE RELEVANCE OF COMMUNICATION ENGINEERING INTERACTIVE exercises and problem sets The book promotes active learning and critical thinking through PROBLEMSOLVING EXERCISES UPTODATE COVERAGE OF EMERGING TECHNOLOGIES THE BOOK INCORPORATES THE LATEST ADVANCEMENTS IN WIRELESS COMMUNICATION OPTICAL FIBER AND OTHER AREAS 5 WHAT ARE SOME OF THE FUTURE TRENDS IN COMMUNICATION ENGINEERING COMMUNICATION ENGINEERING IS A DYNAMIC FIELD CONSTANTLY EVOLVING WITH NEW TECHNOLOGIES AND APPLICATIONS SOME KEY FUTURE TRENDS INCLUDE 5G AND BEYOND DEVELOPMENT OF NEXTGENERATION WIRELESS NETWORKS WITH HIGHER DATA RATES LOWER LATENCY AND IMPROVED RELIABILITY INTERNET OF THINGS IOT CONNECTING BILLIONS OF DEVICES TO THE INTERNET CREATING NEW APPLICATIONS AND CHALLENGES FOR COMMUNICATION SYSTEMS ARTIFICIAL INTELLIGENCE AI UTILIZING AI TO OPTIMIZE NETWORK PERFORMANCE IMPROVE SECURITY AND ENABLE INTELLIGENT COMMUNICATION SYSTEMS QUANTUM COMMUNICATION EXPLORING THE POTENTIAL OF QUANTUM MECHANICS for secure and ultra fast communication Satellite communication Expansion of satellite NETWORKS TO PROVIDE GLOBAL CONNECTIVITY ESPECIALLY IN REMOTE AREAS BY UNDERSTANDING THESE TRENDS READERS CAN GAIN A VALUABLE PERSPECTIVE ON THE FUTURE DIRECTION OF COMMUNICATION ENGINEERING AND THE EXCITING POSSIBILITIES THAT LIE AHEAD 4

COMMUNICATION SYSTEMS - ICOMMUNICATION SYSTEMS - IICOMMUNICATION THEORYPRINCIPLES OF COMMUNICATIONANALOG AND DIGITAL COMMUNICATIONDIGITAL COMMUNICATIONSHANDBOOK OF SYSTEMS ENGINEERING AND RISK MANAGEMENT IN CONTROL SYSTEMS, COMMUNICATION, SPACE TECHNOLOGY, MISSILE, SECURITY AND DEFENSE OPERATIONSINFORMATION THEORY AND CODINGWIRELESS COMMUNICATIONSATELLITE COMMUNICATION SYSTEMS FOR A SUSTAINABLE FUTURE TELECOMMUNICATION NETWORKS ADVANCED HYBRID INFORMATION PROCESSING COMPUTATIONAL SCIENCE - ICCS 2019 THE ORIGIN OF INJUSTICE IN AIR AND SPACE LAW INFORMATION AND COMMUNICATION TECHNOLOGY FOR COMPETITIVE STRATEGIES IOT-BASED SMART WASTE MANAGEMENT FOR ENVIRONMENTAL SUSTAINABILITY SIGNALS & SYSTEM ANALYSIS TOWARDS EXPRESSIVE PERCEPTION AND GENERATION IN HUMAN-COMPUTER CONVERSATIONAL INTERACTION DR. J. S. CHITODE DR. J. S. CHITODE DR. J. S. CHITODE DR. J. S. CHITODE ANNA M. DOROON DR. J. S. CHITODE MAINAK CHOWDHURY BANERJEE, P. DR. J. S. CHITODE RAJSHREE SRIVASTAVA EUGENIO IANNONE GUANGLU SUN JO? O M. F. RODRIGUES JOON SIK JUNG SIMON FONG BISWARANJAN ACHARYA DR. J. S. CHITODE YAOHUA BU

COMMUNICATION SYSTEMS - I COMMUNICATION SYSTEMS - II COMMUNICATION THEORY PRINCIPLES OF COMMUNICATION ANALOG AND DIGITAL COMMUNICATION DIGITAL COMMUNICATIONS HANDBOOK OF SYSTEMS ENGINEERING AND RISK MANAGEMENT IN CONTROL SYSTEMS, COMMUNICATION, SPACE TECHNOLOGY, MISSILE, SECURITY AND DEFENSE OPERATIONS INFORMATION THEORY AND CODING WIRELESS COMMUNICATION SATELLITE COMMUNICATION SIGNALS AND SYSTEMS GREEN INFORMATION AND COMMUNICATION SYSTEMS FOR A SUSTAINABLE FUTURE TELECOMMUNICATION NETWORKS ADVANCED HYBRID INFORMATION PROCESSING COMPUTATIONAL SCIENCE - ICCS 2019 THE ORIGIN OF INJUSTICE IN AIR AND SPACE LAW INFORMATION AND COMMUNICATION TECHNOLOGY FOR COMPETITIVE STRATEGIES IOT-BASED SMART WASTE MANAGEMENT FOR ENVIRONMENTAL SUSTAINABILITY SIGNALS & SYSTEM ANALYSIS TOWARDS EXPRESSIVE PERCEPTION AND GENERATION IN HUMAN-COMPUTER CONVERSATIONAL INTERACTION DR. J. S. CHITODE DR. J. S. CHITODE DR. J. S. CHITODE DR. J. S. CHITODE ANNA M. DORO-ON DR. J. S. CHITODE MAINAK CHOWDHURY BANERJEE, P. DR. J. S. CHITODE RAJSHREE SRIVASTAVA EUGENIO IANNONE

Guanglu Sun Jo[] o M. F. Rodrigue\$00n Sik Jung Simon Fong Biswaranjan Acharya Dr. J. S. Chitode Yaohua Bu

ANALYSIS TOOLS SUCH AS FOURIER SERIES FOURIER TRANSFORMS SIGNALS SYSTEMS AND SPECTRAL DENSITIES ARE DISCUSSED IN THE SECOND CHAPTER INTRODUCTION IS PRESENTED IN THE FIRST CHAPTER THIRD CHAPTER PRESENTS ADDITIONAL ANALYSIS TECHNIQUES SUCH AS PROBABILITY RANDOM VARIABLES DISTRIBUTION FUNCTIONS AND DENSITY FUNCTIONS PROBABILITY MODELS AND RANDOM PROCESSES ARE ALSO DISCUSSED NOISE REPRESENTATION SOURCES NOISE FACTOR NOISE TEMPERATURE FILTERING OF NOISE NOISE BANDWIDTH AND PERFORMANCE OF AM FM IN PRESENCE OF NOISE IS DISCUSSED IN FOURTH CHAPTER ANALOG PULSE MODULATION IS PRESENTED IN FIFTH CHAPTER SAMPLING PAM PAM TDM ARE DISCUSSED IN THIS CHAPTER SIXTH CHAPTER DEALS WITH DIGITAL PULSE MODULATION METHODS SUCH AS PCM DM ADM AND DPCM SEVENTH CHAPTER PRESENTS DIGITAL MULTIPLEXERS LINE CODING SYNCHRONIZATION SCRAMBLERS ISI EYE PATTERNS AND EQUALIZATION TECHNIQUES DIGITAL MODULATION IS PRESENTED IN EIGHTH CHAPTER PHASE SHIFT KEYING FREQUENCY SHIFT KEYING QPSK QAM AND MSK ARE PRESENTED LAST CHAPTER DEALS WITH ERROR PERFORMANCE OF THESE TECHNIQUES USING MATCHED FILTER

INTRODUCTION IN FIRST CHAPTER INCLUDES VARIOUS TOPICS GIVEN IN THE BOOK SECOND CHAPTER DEALS WITH INFORMATION THEORY THAT INCLUDES MODES OF SOURCES AND CHANNELS INFORMATION AND ENTROPY SOURCE CODING DISCRETE MEMORYLESS CHANNELS MUTUAL INFORMATION AND SHANNON S THEOREMS ARE GIVEN LINEAR BLOCK CODES CYCLIC CODES HAMMING CODES SYNDROME DECODING CONVOLUTIONAL CODES ARE GIVEN IN THIRD CHAPTER SPREAD SPECTRUM COMMUNICATION INCLUDES PSEUDO NOISE SEQUENCES DIRECT SEQUENCE AND FREQUENCY HOP SPREAD SPECTRUM IT IS PRESENTED IN FOURTH CHAPTER MULTIPLE ACCESS TECHNIQUES ARE REVIEWED IN FIFTH CHAPTER SIXTH CHAPTER DEALS WITH SATELLITE COMMUNICATIONS SATELLITE ORBITS SATELLITE ACCESS EARTH STATION TRANSPONDER FREQUENCY REUSE LINK BUDGET VSAT AND MSAT ARE PRESENTED FIBRE OPTIC COMMUNICATION IS INTRODUCED IN SEVENTH CHAPTER LIGHT PROPAGATION IN FIBER LOSSES MODES DISPERSION LIGHT SOURCES AND DETECTORS FIBER OPTIC LINK ARE PRESENTED IN THIS CHAPTER

AMPLITUDE MODULATION AND ANGLE MODULATION ARE DISCUSSED IN FIRST TWO CHAPTERS AM FM ANALYSIS EQUATIONS MODULATORS DETECTORS TRANSMISSION AND RECEPTION ARE THOROUGHLY PRESENTED SSB DSB VSB FDM ARE ALSO DISCUSSED NOISE THEORY IS GIVEN IN THIRD CHAPTER IT INCLUDES RANDOM VARIABLES PROBABILITY RANDOM PROCESSES AND CORRELATION FUNCTIONS NOISE FACTOR NOISE TEMPERATURE AND MATHEMATICAL ANALYSIS OF NOISE IS PRESENTED PERFORMANCE OF MODULATION SYSTEMS IN THE PRESENCE OF NOISE IS EXPLAINED IN FOURTH CHAPTER FIGURE OF MERIT CAPTURE EFFECT AND THRESHOLD EFFECT ARE ALSO PRESENTED LAST CHAPTER PRESENTS INFORMATION THEORY ENTROPY INFORMATION RATE DISCRETE MEMORYLESS SOURCE SOURCE CODING SHANNON S THEOREMS ARE ALSO GIVEN IN DETAIL MUTUAL INFORMATION AND CHANNEL CAPACITY ARE ALSO PRESENTED

COMMUNICATION PROCESS SOURCE OF INFORMATION COMMUNICATION CHANNELS BASE BAND AND PASS BAND SIGNALS REPRESENTATION OF SIGNAL AND SYSTEMS THE MODULATION PROCESS PRIMARY COMMUNICATION RESOURCES ANALOG VERSUS DIGITAL COMMUNICATIONS AMPLITUDE MODULATIONFREQUENCY DIVISION AND TIME DIVISION MULTIPLEXING SUPPRESSED CARRIER SYSTEMS SINGLE SIDE BAND TRANSMISSION AMPLITUDE MODULATION WITH CARRIER POWER EFFECT OF FREQUENCY AND PHASE ERRORS IN SYNCHRONOUS DETECTION COMPARISON OF VARIOUS AM SYSTEMS VESTIGIAL SIDE BAND TRANSMISSION ANGLE MODULATIONNARROW AND WIDE BAND FM MULTIPLE FREQUENCY AND SQUARE WAVE MODULATION LINEAR AND NON LINEAR MODULATION PHASE MODULATION DEMODULATION OF FM SIGNALS NOISE REDUCTION PULSE MODULATION PULSE AMPLITUDE MODULATION OTHER FORMS OF PULSE MODULATION BANDWIDTH REQUIRED FOR TRANSMISSION PAM SIGNALS COMPARISON OF FREQUENCY DIVISION AND TIME DIVISION MULTIPLEXED SYSTEMS NOISEDIFFERENT TYPES OF NOISE NOISE CALCULATIONS EQUIVALENT NOISE BANDWIDTH NOISE FIGURES EFFECTIVE NOISE TEMPERATURE NOISE FIGURE IN CASCADED STAGES PERFORMANCE OF COMMUNICATION SYSTEMSNOISE CALCULATION IN COMMUNICATION SYSTEMS NOISE IN AMPLITUDE MODULATED ANGLE MODULATED AND PULSE MODULATED SYSTEMS COMPARISON OF CODED AND UN CODED SYSTEMS INFORMATION TRANSMISSIONMEASURES OF

INFORMATION CHANNEL CAPACITY TRANSMISSION OF CONTINUOUS SIGNALS EXCHANGE OF BANDWIDTH FOR SIGNAL TO NOISE RATIO EFFICIENCY OF PCM SYSTEMS

AMPLITUDE MODULATION TRANSMISSION AND RECEPTIONPRINCIPLES OF AMPLITUDE MODULATION AM ENVELOPE FREQUENCY SPECTRUM AND BANDWIDTH MODULATION INDEX AND PERCENT MODULATION AM POWER DISTRIBUTION AM MODULATOR CIRCUITS LOW LEVEL AM MODULATOR MEDIUM POWER AM MODULATOR AM TRANSMITTERS LOW LEVEL TRANSMITTERS HIGH LEVEL TRANSMITTERS RECEIVER PARAMETERS AM RECEPTION AM RECEIVERS TRF SUPER HETERODYNE RECEIVER DOUBLE CONVERSION AM RECIVERS ANGLE MODULATION TRANSMISSION AND RECEPTION ANGLE MODULATION FM AND PM WAVEFORMS PHASE DEVIATION AND MODULATION INDEX FREQUENCY DEVIATION PHASE AND FREQUENCY MODULATORS AND DEMODULATORS FREQUENCY SPECTRUM OF ANGLE MODULATED WAVES BANDWIDTH REQUIREMENTS OF ANGLE MODULATED WAVES COMMERCIAL BROADCAST BAND FM AVERAGE POWER OF AN ANGLE MODULATED WAVE FREQUENCY AND PHASE MODULATORS A DIRECT FM TRANSMITTERS INDIRECT TRANSMITTERS ANGLE MODULATION VS AMPLITUDE MODULATION FM RECEIVERS FM DEMODULATORS PLL FM DEMODULATORS FM NOISE SUPPRESSION FREQUENCY VERSUS PHASE MODULATION DIGITAL TRANSMISSION AND DATA COMMUNICATIONINTRODUCTION PULSE MODULATION PCM PCM SAMPLING SAMPLING RATE SIGNAL TO QUANTIZATION NOISE RATE COMPANDING ANALOG AND DIGTIAL PERCENTAGE ERROR DELTA MODULATION ADAPTIVE DELTA MODULATION DIFFERENTIAL PUSLE CODE MODULATION PULSE TRANSMISSION ISI EYEPATTERN DATA COMMUNICATION HISTORY STANDARDS DATA COMMUNICATION CIRCUITS DATA COMMUNICATION CODES ERROR CONTROL HARDWARE SERIAL AND PARALLEL INTERFACES DATA MODEMS ASYNCHRONOUS MODEM SYNCHRONOUS MODEM LOW SPEED MODEM MEDIUM AND HIGH SPEED MODEM MODEM CONTROL DIGITAL COMMUNICATION INTRODUCTION SHANNON LIMIT FOR INFORMATION CAPACITY DIGITAL AMPLITUDE MODULATION FREQUENCY SHIFT KEYING FSK BIT RATE AND BAUD FSK TRANSMITTER BW CONSIDERATION OF FSK FSK RECEIVER PHASE SHIFT KEYING BINARY PHASE SHIFT KEYING QPSK QUANDRATURE AMPLITUDE MODULATION BANDWIDTH EFFICIENCY CARRIER RECOVERY SQUARING LOOP COSTAS LOOP DPSK SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES INTRODUCTION PSEUDO NOISE SEQUENCE DS SPREAD SPECTRUM WITH COHERENT BINARY PSK PROCESSING GAIN FH SPREAD SPECTRUM MULTIPLE ACCESS TECHNIQUES WIRELESS COMMUNICATION TDMA AND FDMA WIRELESS COMMUNICATION SYSTEMS SOURCE CODING OF SPEECH FOR WIRELESS COMMUNICATIONS

THERE ARE EIGHT CHAPTERS USEFUL APPENDIX AND SOLVED QUESTION PAPERS IN THE BOOK BASIC DIGITAL COMMUNICATION LINE CODES AND SAMPLING METHODS ARE PRESENTED AT THE BEGINNING DIGITAL PULSE MODULATION TECHNIQUES SUCH AS PCM DPCM DM ADM ARE PRESENTED CONTINUOUS WAVE DIGITAL MODULATION METHODS SUCH AS BPSK DPSK QPSK QAM BFSK AND OOK ARE PRESENTED WITH MATHEMATICAL ANALYSIS OF MODULATORS AND RECEIVERS ISSUES RELATED TO BASEBAND TRANSMISSION SUCH AS ISI NYQUIST PULSE SHAPING CRITERIAN OPTIMUM RECEPTION MATCHED FILTER AND EYE PATTERNS ARE ALSO DISCUSSED CONCEPTS OF INFORMATION THEORY SUCH AS DISCRETE MEMORYLESS CHANNELS MUTUAL INFORMATION SHANNON S THEOREMS ON SOURCE CODING ARE ALSO PRESENTED CODING USING LINEAR BLOCK CODES CYCLIC CODES AND CONVOLUTIONAL CODING IS ALSO DISCUSSED SECURED COMMUNICATION USING SPREAD SPECTRUM MODULATION IS ALSO DISCUSSED IN DETAIL

THIS BOOK PROVIDES MULTIFACETED COMPONENTS AND FULL PRACTICAL PERSPECTIVES OF SYSTEMS ENGINEERING AND RISK MANAGEMENT IN SECURITY AND DEFENSE OPERATIONS WITH A FOCUS ON INFRASTRUCTURE AND MANPOWER CONTROL SYSTEMS MISSILE DESIGN SPACE TECHNOLOGY SATELLITES INTERCONTINENTAL BALLISTIC MISSILES AND SPACE SECURITY WHILE THERE ARE MANY EXISTING SELECTIONS OF SYSTEMS ENGINEERING AND RISK MANAGEMENT TEXTBOOKS THERE IS NO EXISTING WORK THAT CONNECTS SYSTEMS ENGINEERING AND RISK MANAGEMENT CONCEPTS TO SOLIDIFY ITS USABILITY IN THE ENTIRE SECURITY AND DEFENSE ACTIONS WITH THIS BOOK DR ANNA M DORO ON RECTIFIES THE CURRENT IMBALANCE SHE PROVIDES A COMPREHENSIVE OVERVIEW OF SYSTEMS ENGINEERING AND RISK MANAGEMENT BEFORE MOVING TO DEEPER PRACTICAL ENGINEERING PRINCIPLES INTEGRATED WITH NEWLY DEVELOPED CONCEPTS AND EXAMPLES BASED ON INDUSTRY AND GOVERNMENT METHODOLOGIES THE CHAPTERS ALSO COVER RELATED POINTS INCLUDING DESIGN PRINCIPLES FOR DEFEATING AND DEACTIVATING IMPROVISED EXPLOSIVE DEVICES AND LAND MINES AND SECURITY MEASURES AGAINST KINDS OF

THREATS THE BOOK IS DESIGNED FOR SYSTEMS ENGINEERS IN PRACTICE POLITICAL RISK PROFESSIONALS MANAGERS POLICY MAKERS ENGINEERS IN OTHER ENGINEERING FIELDS SCIENTISTS DECISION MAKERS IN INDUSTRY AND GOVERNMENT AND TO SERVE AS A REFERENCE WORK IN SYSTEMS ENGINEERING AND RISK MANAGEMENT COURSES WITH FOCUS ON SECURITY AND DEFENSE OPERATIONS

VARIOUS MEASURES OF INFORMATION ARE DISCUSSED IN FIRST CHAPTER INFORMATION RATE ENTROPY AND MARK OFF MODELS ARE PRESENTED SECOND AND THIRD CHAPTER DEALS WITH SOURCE CODING SHANNON S ENCODING ALGORITHM DISCRETE COMMUNICATION CHANNELS MUTUAL INFORMATION SHANNON S FIRST THEOREM ARE ALSO PRESENTED HUFFMAN CODING AND SHANNON FANO CODING IS ALSO DISCUSSED CONTINUOUS CHANNELS ARE DISCUSSED IN FOURTH CHAPTER CHANNEL CODING THEOREM AND CHANNEL CAPACITY THEOREMS ARE ALSO PRESENTED BLOCK CODES ARE DISCUSSED IN CHAPTER FIFTH SIXTH AND SEVENTH LINEAR BLOCK CODES HAMMING CODES SYNDROME DECODING IS PRESENTED IN DETAIL STRUCTURE AND PROPERTIES OF CYCLIC CODES ENCODING AND SYNDROME DECODING FOR CYCLIC CODES IS ALSO DISCUSSED ADDITIONAL CYCLIC CODES SUCH AS RS CODES GOLAY CODES BURST ERROR CORRECTION IS ALSO DISCUSSED LAST CHAPTER PRESENTS CONVOLUTIONAL CODES TIME DOMAIN TRANSFORM DOMAIN APPROACH CODE TREE CODE TRELLIS STATE DIAGRAM VITERBI DECODING IS DISCUSSED IN DETAIL

THIS BOOK PROVIDES EXTENSIVE COVERAGE OF FUNDAMENTAL CONCEPTS OF WIRELESS COMMUNICATION INCLUDING COVERAGE OF RECENT DEVELOPMENTS AND APPLICATIONS IN WIRELESS SYSTEMS

DESIGNED AS A TEXT FOR THE UNDERGRADUATE STUDENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING ELECTRONICS AND TELECOMMUNICATION ENGINEERING AS WELL AS FOR POSTGRADUATE STUDENTS OF COMMUNICATION SYSTEMS ELECTRONICS AND COMMUNICATION ENGINEERING THE BOOK PRESENTS ALL THE TOPICS RELATED TO SATELLITE COMMUNICATION IN AN ORGANISED WAY STARTING FROM THE BASIC CONCEPTS TO THE LATEST ADVANCEMENTS IN THE FIELD THE BOOK COMMENCES WITH AN INTRODUCTORY CHAPTER THAT FAMILIARISES THE READERS WITH THE EVOLUTION OF SATELLITE COMMUNICATION THE FOLLOWING CHAPTERS EXPATIATE ON ORBITAL MECHANICS PERTURBATION FACTORS OF THE ORBIT AND DIFFERENT ORBIT CONFIGURATIONS NEXT THE LAUNCHING MECHANISM AND SATELLITE SUB SYSTEMS WHICH TOGETHER CONFIGURE A COMPLETE SATELLITE SYSTEM ARE FOCUSED THE BOOK FURTHER EXPLICATES THE LINK CALCULATION TO FACILITATE THE DESIGN ASPECT IN ADDITION SATELLITE ACCESS MECHANISM AND INTERNET LINKING VIA SATELLITE ARE ALSO OUTLINED IN THE TEXT FINALLY THE CONCLUDING CHAPTERS OF THE BOOK ELABORATE NAVIGATION SATELLITE DIRECT BROADCASTING SATELLITE TELEVISION VSAT AND SPECIAL PURPOSE SATELLITES WITH ALL THE CONTENTS ENRICHED BY THE VAST EXPERIENCE OF THE AUTHOR THE BOOK PROVIDES A COMPREHENSIVE TREATMENT OF THE SUBJECT AND ENABLES THE STUDENTS TO RELY UPON THIS EXCLUSIVE BOOK ONLY KEY FEATURES THE PRESENTATION OF EVERY TOPIC IS KEPT SIMPLE AND SYSTEMATIC TO HELP STUDENTS UNDERSTAND THE COMPLICATED CONCEPTS EASILY ANNEXURES COVERING PRESENTATIONS OF SOME ADDITIONAL RELEVANT INFORMATION ARE APPENDED TO MOST OF THE CHAPTERS THE BOOK IS RICH IN PEDAGOGICAL FEATURES TO THE FULL WHICH INCLUDE AMPLE FIGURES AND TABLES SUMMARY AND REVIEW QUESTIONS AT THE END OF EACH CHAPTER SOLVED NUMERICAL PROBLEMS ARE PROVIDED IN BETWEEN THE TEXT BIBLIOGRAPHY IS GIVEN AT THE END OF THE BOOK

ANALYSIS OF SIGNALS IS GIVEN IN FIRST CHAPTER TYPES OF SIGNALS PROPERTIES OF SYSTEMS ARE ALSO PRESENTED SECOND CHAPTER PRESENTS FOURIER SERIES ANALYSIS ITS PROPERTIES ARE ALSO DISCUSSED FOURIER TRANSFORM IS GIVEN IN THIRD CHAPTER ALONG WITH ITS PROPERTIES THE TRANSMISSION OF SIGNALS THROUGH LINEAR SYSTEMS IN GIVEN IN FOURTH CHAPTER REALIZABILITY AND DISTORTION LESS TRANSMISSION IS ALSO DISCUSSED FIFTH CHAPTER DISCUSSES CONVOLUTION ITS PROPERTIES AND IMPULSE RESPONSE PROPERTIES OF LTI SYSTEMS CAUSALITY AND STABILITY ARE DISCUSSED AUTOCORRELATION AND CROSS CORRELATION IS ALSO GIVEN ENERGY SPECTRAL DENSITY AND POWER SPECTRAL DENSITY ALONG WITH THEIR PROPERTIES ARE ALSO GIVEN SAMPLING PRINCIPLES AND TYPES ARE GIVEN IN SIXTH CHAPTER CHAPTER SEVENTH AND EIGHTH PRESENTS LAPLACE TRANSFORMS AND Z TRANSFORMS IN DETAIL THEIR PROPERTIES INVERSION AND APPLICATIONS TO LTI SYSTEMS ARE ANALYZED IN DETAIL RELATIONSHIPS AMONG TRANSFORMS ARE ALSO GIVEN ALL THE CONCEPTS

## ARE SUPPORTED WITH LOT OF SOLVED EXAMPLES

GREEN INFORMATION AND COMMUNICATION SYSTEMS FOR A SUSTAINABLE FUTURE COVERS THE FUNDAMENTAL CONCEPTS APPLICATIONS ALGORITHMS PROTOCOLS NEW TRENDS CHALLENGES AND RESEARCH RESULTS IN THE AREA OF GREEN INFORMATION AND COMMUNICATION SYSTEMS THIS BOOK PROVIDES THE READER WITH UP TO DATE INFORMATION ON CORE AND SPECIALIZED ISSUES MAKING IT HIGHLY SUITABLE FOR BOTH THE NOVICE AND THE EXPERIENCED RESEARCHER IN THE FIELD THE BOOK COVERS THEORETICAL AND PRACTICAL PERSPECTIVES ON NETWORK DESIGN IT INCLUDES HOW GREEN ICT INITIATIVES AND APPLICATIONS CAN PLAY A MAJOR ROLE IN REDUCING CO 2 EMISSIONS AND FOCUSES ON INDUSTRY AND HOW IT CAN PROMOTE AWARENESS AND IMPLEMENTATION OF GREEN ICT THE BOOK DISCUSSES SCHOLARSHIP AND RESEARCH IN GREEN AND SUSTAINABLE IT FOR BUSINESS AND ORGANIZATIONS AND USES THE POWER OF IT TO USHER SUSTAINABILITY INTO OTHER PARTS OF AN ORGANIZATION BUSINESS AND MANAGEMENT EDUCATORS MANAGEMENT RESEARCHERS DOCTORAL SCHOLARS UNIVERSITY TEACHING PERSONNEL AND POLICY MAKERS AS WELL AS MEMBERS OF HIGHER ACADEMIC RESEARCH ORGANIZATIONS WILL ALL DISCOVER THIS BOOK TO BE AN INDISPENSABLE GUIDE TO GREEN INFORMATION AND COMMUNICATION SYSTEMS IT WILL ALSO SERVE AS A KEY RESOURCE FOR INDUSTRIAL AND MANAGEMENT TRAINING ORGANIZATIONS ALL OVER THE WORLD

MANY ARGUE THAT TELECOMMUNICATIONS NETWORK INFRASTRUCTURE IS THE MOST IMPRESSIVE AND IMPORTANT TECHNOLOGY EVER DEVELOPED ANALYZING THE TELECOM MARKET S CONSTANTLY EVOLVING TRENDS RESEARCH DIRECTIONS INFRASTRUCTURE AND VITAL NEEDS TELECOMMUNICATION NETWORKS RESPONDS WITH REVOLUTIONIZED ENGINEERING STRATEGIES TO OPTIMIZE NETWORK CONSTRUCTION OMNIPRESENT IN SOCIETY TELECOM NETWORKS INTEGRATE A WIDE RANGE OF TECHNOLOGIES THESE INCLUDE QUANTUM FIELD THEORY FOR THE STUDY OF OPTICAL AMPLIFIERS SOFTWARE ARCHITECTURES FOR NETWORK CONTROL ABSTRACT ALGEBRA REQUIRED TO DESIGN ERROR CORRECTION CODES AND NETWORK THERMAL AND MECHANICAL MODELING FOR EQUIPMENT PLATFORM DESIGN ILLUSTRATING HOW AND WHY NETWORK DEVELOPERS MAKE TECHNICAL DECISIONS THIS BOOK TAKES A PRACTICAL ENGINEERING APPROACH TO SYSTEMATICALLY ASSESS THE NETWORK AS A WHOLE FROM TRANSMISSION TO SWITCHING EMPHASIZING A UNIFORM BIBLIOGRAPHY AND DESCRIPTION OF STANDARDS IT EXPLORES EXISTING TECHNICAL DEVELOPMENTS AND THE POTENTIAL FOR PROJECTED ALTERNATIVE ARCHITECTURAL PATHS BASED ON CURRENT MARKET INDICATORS THE AUTHOR CHARACTERIZES NEW DEVICE AND EQUIPMENT ADVANCES NOT JUST AS QUALITY IMPROVEMENTS BUT AS SPECIFIC RESPONSES TO PARTICULAR TECHNICAL MARKET NECESSITIES ANALYZING DESIGN PROBLEMS TO IDENTIFY POTENTIAL LINKS AND COMMONALITIES BETWEEN DIFFERENT PARTS OF THE SYSTEM THE BOOK ADDRESSES INTERDEPENDENCE OF THESE ELEMENTS AND THEIR INDIVIDUAL INFLUENCE ON NETWORK EVOLUTION IT ALSO CONSIDERS POWER CONSUMPTION AND REAL ESTATE WHICH SOMETIMES OUTWEIGH ENGINEERING PERFORMANCE DATA IN DETERMINING A PRODUCT S SUCCESS TO CLARIFY THE POTENTIAL AND LIMITATIONS OF EACH PRESENTED TECHNOLOGY AND SYSTEM ANALYSIS THE BOOK INCLUDES QUANTITATIVE DATA INSPIRED BY REAL PRODUCTS AND PROTOTYPES WHENEVER POSSIBLE IT APPLIES MATHEMATICAL MODELING TO PRESENT MEASURED DATA ENABLING THE READER TO APPLY DEMONSTRATED CONCEPTS IN REAL WORLD SITUATIONS COVERING EVERYTHING FROM HIGH LEVEL ARCHITECTURAL ELEMENTS TO MORE BASIC COMPONENT PHYSICS ITS FOCUS IS TO SOLVE A PROBLEM FROM DIFFERENT PERSPECTIVES AND BRIDGE DESCRIPTIONS OF WELL CONSOLIDATED SOLUTIONS WITH NEWER RESEARCH **TRENDS** 

This book constitutes the refereed proceedings of the first international conference on advanced hybrid information processing adhib  $20\,17$  held in harbin china in July  $20\,17$  the 64 full papers were selected from 134 submissions and focus on advanced methods and applications for hybrid information processing

THE FIVE VOLUME SET LNCS 11536 11537 11538 11539 and 11540 constitutes the proceedings of the 19th international conference on computational science iccs 2019 held in faro portugal in june 2019 the total of 65 full papers and 168 workshop papers presented in this book set were carefully reviewed and selected from 573 submissions 228 submissions to the main track and 345

SUBMISSIONS TO THE WORKSHOPS THE PAPERS WERE ORGANIZED IN TOPICAL SECTIONS NAMED PART I ICCS MAIN TRACK PART II ICCS MAIN TRACK TRACK OF ADVANCES IN HIGH PERFORMANCE COMPUTATIONAL EARTH SCIENCES APPLICATIONS AND FRAMEWORKS TRACK OF AGENT BASED SIMULATIONS ADAPTIVE ALGORITHMS AND SOLVERS TRACK OF APPLICATIONS OF MATRIX METHODS IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TRACK OF ARCHITECTURE LANGUAGES COMPILATION AND HARDWARE SUPPORT FOR EMERGING AND HETEROGENEOUS SYSTEMS PART III TRACK OF BIOMEDICAL AND BIOINFORMATICS CHALLENGES FOR COMPUTER SCIENCE TRACK OF CLASSIFIER LEARNING FROM DIFFICULT DATA TRACK OF COMPUTATIONAL FINANCE AND BUSINESS INTELLIGENCE TRACK OF COMPUTATIONAL OPTIMIZATION MODELLING AND SIMULATION TRACK OF COMPUTATIONAL SCIENCE IN IOT AND SMART SYSTEMS PART IV TRACK OF DATA DRIVEN COMPUTATIONAL SCIENCES TRACK OF MACHINE LEARNING AND DATA ASSIMILATION FOR DYNAMICAL SYSTEMS TRACK OF MARINE COMPUTING IN THE INTERCONNECTED WORLD FOR THE BENEFIT OF THE SOCIETY TRACK OF MULTISCALE MODELLING AND SIMULATION TRACK OF SIMULATIONS OF FLOW AND TRANSPORT MODELING ALGORITHMS AND COMPUTATION PART V TRACK OF SMART SYSTEMS COMPUTER VISION SENSOR NETWORKS AND MACHINE LEARNING TRACK OF SOLVING PROBLEMS WITH UNCERTAINTIES TRACK OF TEACHING COMPUTATIONAL SCIENCE POSTER TRACK ICCS 2019 CHAPTER COMPARING DOMAIN DECOMPOSITION METHODS FOR THE PARALLELIZATION OF DISTRIBUTED LAND SURFACE MODELS IS AVAILABLE OPEN ACCESS UNDER A CREATIVE COMMONS ATTRIBUTION 4 0 INTERNATIONAL LICENSE VIA LINK SPRINGER COM

THE MOST IMPORTANT RESOURCES IN CIVIL AVIATION AND COMMERCIAL USE OF THE OUTER SPACE ARE LEGAL RIGHTS TO OCCUPY CERTAIN SPACE IN AIRPORTS AND GEOSTATIONARY ORBITS RESPECTIVELY THIS BOOK CLARIFIES THE NATURE OF THE RIGHTS CALLED SLOTS IN BOTH ARENA IT THEN REVIEWS BOTH THE DOMESTIC AND INTERNATIONAL SLOT DISTRIBUTION MECHANISMS AND COMMON LAW PRINCIPLES THEREIN

THIS BOOK CONTAINS 74 PAPERS PRESENTED AT ICTCS 2017 THIRD INTERNATIONAL CONFERENCE ON INFORMATION AND COMMUNICATION TECHNOLOGY FOR COMPETITIVE STRATEGIES THE CONFERENCE WAS HELD DURING 16 17 DECEMBER 2017 UDAIPUR INDIA AND ORGANIZED BY ASSOCIATION OF COMPUTING MACHINERY UDAIPUR PROFESSIONAL CHAPTER IN ASSOCIATION WITH THE INSTITUTION OF ENGINEERS INDIA UDAIPUR LOCAL CENTER AND GLOBAL KNOWLEDGE RESEARCH FOUNDATION THIS BOOK CONTAINS PAPERS MAINLY FOCUSED ON ICT FOR COMPUTATION ALGORITHMS AND DATA ANALYTICS AND IT SECURITY ETC

THIS BOOK CONSOLIDATES AND SUMMARIZES SMART TECHNOLOGIES LIKE IOT EDGE COMPUTING AND AI USED IN DIFFERENT ASPECTS OF WASTE MATERIAL MANAGEMENT MITIGATION AND RECYCLING FOR A SUSTAINABLE ENVIRONMENT ONE OF THE CASES EXPLAINS HOW IOT BASED SYSTEMS AND WIRELESS SENSORS CAN BE USED TO CONTINUOUSLY DETECT COMMON POLLUTANTS SUCH AS VOLATILE ORGANIC COMPOUNDS VOCS CARBON MONOXIDE AND PARTICULATE MATTER PM AND HOW THE DATA COLLECTED ARE USED TO ASSESS THE OVERALL AIR QUALITY AND DETERMINE ACTIONS FOR IMPROVEMENTS A COLLECTION OF PRACTICAL CASE STUDIES THIS BOOK PROVIDES A COMPREHENSIVE KNOWLEDGE IN SMART WASTE MANAGEMENT TO READERS IN UNIVERSITIES RESEARCH CENTERS AND INDUSTRIES

THE BOOK IS WRITTEN FOR AN UNDERGRADUATE COURSE ON THE SIGNALS AND SYSTEMS IT PROVIDES COMPREHENSIVE EXPLANATION OF CONTINUOUS TIME SIGNALS AND SYSTEMS ANALOGOUS SYSTEMS FOURIER TRANSFORM LAPLACE TRANSFORM STATE VARIABLE ANALYSIS AND Z TRANSFORM ANALYSIS OF SYSTEMS THE BOOK STARTS WITH THE VARIOUS TYPES OF SIGNALS AND OPERATIONS ON SIGNALS IT EXPLAINS THE CLASSIFICATION OF CONTINUOUS TIME SIGNALS AND SYSTEMS THEN IT INCLUDES THE DISCUSSION OF ANALOGOUS SYSTEMS THE BOOK PROVIDES DETAILED DISCUSSION OF FOURIER TRANSFORM REPRESENTATION PROPERTIES OF FOURIER TRANSFORM AND ITS APPLICATIONS TO NETWORK ANALYSIS THE BOOK ALSO COVERS THE LAPLACE TRANSFORM ITS PROPERTIES AND NETWORK ANALYSIS USING LAPLACE TRANSFORM WITH AND WITHOUT INITIAL CONDITIONS THE BOOK PROVIDES THE DETAILED EXPLANATION OF MODERN APPROACH OF SYSTEM ANALYSIS CALLED THE STATE VARIABLE ANALYSIS IT INCLUDES VARIOUS METHODS OF STATE SPACE REPRESENTATION OF SYSTEMS FINDING THE STATE TRANSITION MATRIX AND SOLUTION OF STATE EQUATION THE DISCUSSION OF NETWORK TOPOLOGY IS ALSO INCLUDED IN THE BOOK THE CHAPTER ON Z TRANSFORM INCLUDES

THE PROPERTIES OF ROC PROPERTIES OF Z TRANSFORM INVERSE Z TRANSFORM Z TRANSFORM ANALYSIS OF LTI SYSTEMS AND PULSE TRANSFER FUNCTION THE STATE SPACE REPRESENTATION OF DISCRETE SYSTEMS IS ALSO INCORPORATED IN THE BOOK THE BOOK USES PLAIN SIMPLE AND LUCID LANGUAGE TO EXPLAIN EACH TOPIC THE BOOK PROVIDES THE LOGICAL METHOD OF EXPLAINING THE VARIOUS COMPLICATED TOPICS AND STEPWISE METHODS TO MAKE THE UNDERSTANDING EASY THE VARIETY OF SOLVED EXAMPLES IS THE FEATURE OF THIS BOOK THE BOOK EXPLAINS THE PHILOSOPHY OF THE SUBJECT WHICH MAKES THE UNDERSTANDING OF THE CONCEPTS VERY CLEAR AND MAKES THE SUBJECT MORE INTERESTING

THE CONSTRUCTION OF A NATURAL INTERACTIVE HUMAN COMPUTER INTERACTION HAS BECOME AN INTEGRAL COMPONENT OF INTELLIGENT SYSTEM DEVELOPMENT CONSTITUTING A CORE SUBJECT WITHIN THE FIELD OF HUMAN COMPUTER INTERACTION GROUNDED IN THE UTILIZATION OF HUMAN PERCEPTION THEORIES THIS STUDY PROPOSES A ROBUST METHOD FOR SPEECH EMOTION RECOGNITION AND A MODEL FOR INFERRING USER EMOTIONAL STATE CHANGES THEREBY ACHIEVING A HU MAN COMPUTER INTERACTION EXPERIENCE CHARACTERIZED BY BOTH LISTENING AND ARTICULATING AND CONVEYING SENTIMENTS EFFECTIVELY SIMULTANEOUSLY FOCUSING ON THE AUDIO VISUAL MODALITIES WITHIN HUMAN COMPUTER INTERACTION THIS RESEARCH EXPLORES METHODS FOR CON STRUCTING INTERACTIVE FEEDBACK IN AUDITORY AND VISUAL MODALITIES WITHIN REAL HU MAN COMPUTER DIALOG SCENARIOS THIS AIMS TO SYNCHRONIZE TEXTUAL VERBAL AND VISUAL EXPRESSIONS IN HUMAN COMPUTER INTERACTION ENHANCING ITS NATURALNESS IMPROVING USER EXPERIENCE AND AUGMENTING SATISFACTION AND PLEASURE DURING INTERACTION THE RESEARCH CONTRIBUTIONS ARE AS FOLLOWS INTRODUCING A METHOD THAT ROBUSTLY IDENTIFIES USER EMOTIONAL STATES IN REAL HU MAN COMPUTER SPEECH DIALOGUE SCENARIOS THROUGH THE UTILIZATION OF LOCAL AND GLOBAL ATTENTION MECHANISMS THIS METHOD GENERATES ROBUST AND DISTINGUISHABLE REPRESENTA TIONS OF SPEECH EMOTION THEREBY ENHANCING THE ROBUSTNESS AND ACCURACY OF SPEECH EMOTION RECOGNITION SYSTEMS IN AUTHENTIC DIALOGUE **SCENARIOS** 

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