UNIT I - ANALOG COMMUNICATION

Introduction to analog and digital communication - Analog communication, Digital communications. **Noise sources and classification of noise** - Introduction to noise, External noise, Internal noise, Thermal noise, Thermal noise and reactive circuits, Shot noise, Shot noise in space charge limited diodes, Partition noise. **Noise calculation** - Noise equivalent bandwidth of a filter, Signal to noise ratio, Noise figure, and Equivalent noise temperature. **Introduction to communication system** - Introduction to communication system, Analog and digital communication system, Elements of electronic communication system. **Modulation** - Modulation and demodulation, Need for modulation and its advantages, Modulated signals, Types of modulations. **Amplitude Modulation (AM)** - Introduction to Amplitude Modulation (AM), Principle of amplitude modulation, Advantages and disadvantages of AM, Applications of amplitude modulation. **Frequency and power spectrum of AM wave** - Modulation index of AM wave, Frequency spectrum of AM wave, Problem to calculate modulation index, AM power distributions, AM current relations. **Generation of amplitude modulation** - Generation of AM, Modulators using non-linear devices (Square-law modulators), Modulators using product devices, Modulators using switching devices, Transistor switching modulator. **Evolution and detection of SSB AM signal** - Single sideband AM, Demodulation of SSB AM signal. **Frequency Modulation (FM)** - Frequency Modulation (FM), Mathematical analysis of FM using sinusoidal signal, Characteristics of frequency modulation, Effect of noise in FM. **Phase modulation** - Phase modulation. **Comparison of AM, FM and PM** - Comparison of AM, FM and PM.

UNIT II - DIGITAL COMMUNICATION

Digital modulation techniques - Introduction to digital modulation techniques. **Amplitude shift keying (ASK)** - Amplitude Shift Keying or ON-OFF Keying. **Frequency Shift Keying** - Frequency Shift Keying (FSK), FSK bandwidth, FSK transmitter, FSK receiver, Continuous phase frequency shift keying, Example problems. **Minimum Shift Keying (MSK)** - Minimum Shift Keying (MSK), Geometrical representation of MSK, Power spectral density and bandwidth of MSK, Phase continuity in MSK, MSK transmitter and receiver. **Phase Shift Keying (PSK)** - Phase Shift Keying, BPSK transmitter, Bandwidth of BPSK, BPSK receiver. **Quadrature Phase Shift Keying (QPSK)** - Quadrature Phase Shift Keying (QPSK), QPSK transmitter, Bandwidth of QPSK, QPSK receiver, Offset QPSK. **Eight-Phase Shift Keying (8-PSK)** - 8-PSK transmitter, Bandwidth of 8-PSK, 8-PSK receiver, 16-PSK. **Quadrature amplitude modulation (QAM)** - Quadrature Amplitude Modulation (QAM), 8-QAM, 16-QAM, Bandwidth considerations of 16-QAM. **Bandwidth efficiency** - Bandwidth efficiency, Comparison of modulation methods.

UNIT III - DATA AND PULSE COMMUNICATION

Data communication - Introduction to data communications, History of data communications. **Standards organizations for data communications** - Standards organizations for data communications, International Standards Organization (ISO), International Telecommunications Union-Telecommunications Sector, Institute of Electrical and Electronics Engineers, American National

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Standards Institute, Electronics Industry Association, Telecommunications Industry Association. **Data communication circuits** - Data communication circuits. **Data communication codes -** Data communication codes, Need for data code, Morse code, Baudot code, ASCII code, EBCDIC code. **Error detection and correction techniques** - Error control, Error detection, Vertical redundancy checking, Checksum, Longitudinal redundancy checking, Cyclic redundancy checking, Example Problem for CRC, Error correction, Retransmission, Forward error correction, Hamming codes, Example for Hamming codes. **Data communication hardware -** Data communication hardware, Data terminal equipment, Data communications equipment. **Pulse modulation -** Pulse modulation, PAM, PWM and PPM wave. **Pulse amplitude modulation (PAM),** Introduction to PAM, Generation of PAM, Transmission Bandwidth of PAM Signal, Analysis and Frequency Spectrum of Naturally PAM, Analysis and Spectrum of Flat Top PAM, Aperture Effect, Demodulation of PAM, Comparison of sampling techniques of PAM, Merits and Demerits of PAM. **Pulse Time modulation (PTM) -** Pulse Width Modulation (PWM), Generation of PWM signal, Demodulation of PWM Signal, Advantages and disadvantages of PWM, Frequency spectrum of PWM wave**. Pulse Code modulation (PCM)- Pulse** Code Modulation (PCM),PCM Transmission Path, PCM Receiver, **Comparison of PAM-PTM-PCM** -Comparison of PAM-PTM-PCM.

UNIT IV - SOURCE AND ERROR CONTROL CODING

Entropy- Entropy (Average information), Properties of entropy. **Source coding theorem - Source** coding theorem, Code redundancy and code variance. **Shannon-Fano coding - Shannon**-Fano coding. **Huffman coding - Huffman** coding, Example of Huffman encoding. **Mutual information-**Mutual information, Properties of mutual information, **Channel capacity**- Channel capacity (Shannon's Third theorem or Shannon Hartley law),Tradeoff between bandwidth and signal to noise ratio, Rate/Bandwidth and signal to noise ratio, E_b/N_0 tradeoff, **Error control coding**- Types of error control coding and errors. **Linear block code - Principle** of block coding, Matrix description of linear block codes, Problem to find code vectors, Parity check matrix (H), Problem to find code vectors. **Cyclic codes** -Introduction to cyclic codes, Properties of cyclic codes ,Algebraic structure of cyclic codes, Generation of Code vectors in Non-systematic form, Generation of code vectors in systematic form **Generator and Parity Check Matrices, Syndrome calculator and decoder of cyclic codes -** Nonsystematic Form of Generator Matrix ,Systematic Form of Generator Matrix, Syndrome Decoding, Error Detection and Error Correction, Block Diagram of Syndrome Calculator, Decoder for Cyclic Codes, Advantages and Disadvantages of Cyclic Codes. **Convolution codes** - Convolution coding. **Time domain approach to analysis of convolutional encoder -** Time domain approach to analysis of convolutional encoder, Problem to calculate code rate using convolutional method, Matrix method to calculate output of convolutional encoder, Problem to calculate output code vector using matrix method. **Transform domain approach to analysis of convolutional encoder - Transform** domain approach to analysis of convolutional encoder, Problem to find transform domain using polynomial multiplications, Problem to compute the encoder output for input sequence 101101. **Code tree, code trellis and state diagrams** - Code tree, code trellis and state diagrams, Development of code tree, Code trellis and state diagrams, Problem to construct the code tree for the encoder. **Decoding methods of convolutional codes -** Decoding methods of convolutional codes**, Viterbi decoding algorithm -** Example for Viterbi algorithm, Problem to construct the code tree for the encoder.

UNIT V - MULTI-USER RADIO COMMUNICATION

Introduction to various cellular standards - Introduction to various cellular standards, **Analog Mobile Phone System (AMPS)** - Introduction, AMPS architecture with network elements, Analog signal processing in AMPS. **Global System for Mobile communication (GSM)** - Introduction to GSM, GSM services, GSM architecture, Function partitioning in GSM architecture, Radio characteristics of GSM, Security aspects of GSM, **Code Division Multiple Access (CDMA)** - Introduction to Code Division Multiple Access (CDMA),Introduction to Code Division Multiple Access (CDMA),Basic concepts of CDMA systems used in mobile communication, Features of CDMA, Power control in CDMA, Soft handoff in CDMA, **Basic cellular concept and its operation** -Basic cellular concept and its operation, Introduction to cellular concept, Handoff ,Cell splitting and sectorization, Principle of operation of a cellular mobile system. **Elements of cellular mobile radio systems** - Introduction, Concept of frequency reuse channels, Co-channel interference reduction factor, Desired C/I from a normal case in an omni-directional antenna system, Cell splitting, Components of cellular system. **Frequency management and channel assignment –** Introduction, Numbering the radio channels, Set-up channels, Traffic and channel assignment, Channel assignment algorithms. **Handoff -** Handoff, Types of handoff. **Overview of multiple access schemes**- Multiple access techniques, Time Division Multiple Access (TDMA), Time Division Multiple Accessing (TDMA), Unique word correlator. **Frequency Division Multiple Access (FDMA) -** Frequency Division Multiple Access (FDMA), Problems on FDMA. **Code Division Multiple Access (CDMA)**- Code Division Multiple Access (CDMA) , Block diagram of CDMA. **Satellite communication -** History of satellite communication, Introduction to satellite communication, Classification of satellite communication, Advantage of satellite communication over terrestrial radio communication. **Block diagram of communication satellite -** Comparison of active and passive satellites, **Applications of satellite**- Applications of satellite, Applications of satellite in GPS. **Bluetooth**- Introduction to Bluetooth wireless technology, History of Bluetooth, Bluetooth vision, Specification of Bluetooth, Bluetooth stack architecture, Bluetooth protocols

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