

University of Madras

Bachelor in Information Technology Degree Coursework (Semester System)

SEMESTER – VIII

831 BROADBAND COMMUNICATION

UNIT - I

Introduction to Fiber Optics: Introduction, characteristics of optical fibers, design of the link, optical fiber cables, fiber optic equipment components, optical fiber transmission systems, intensity modulated systems, coherent optical transmission systems, optical multiplexing, repeaters, system designs, optical fiber equipment measurements.

UNIT - II

ISDN Overview: A conceptual view of ISDN, ISDN standards, service capabilities, teleservice protocol architecture, facsimile, and teletex message handling systems. **ISDN Interfaces and functions:** Transmission structure, user-network interface configurations, ISDN protocol architecture, ISDN connections, terminal adaptation, addressing, interworking, ISDN physical layer, line coding techniques, basic user-network interface, primary rate, user-network interface, and U interface.

UNIT - III

ISDN Data link Layer: LAPD, bearer channel link control using I.465/V.120, frame mode bearer service and protocol, ISDN network layer, ISDN call control, frame relay connection control, signaling system number 7, SS7 architecture, signaling, data link level, signaling-link level, signaling network level, signaling connection control part, ISDN user part. **ATM Networking:** Older "transfer mode" networks, the "telegraph transfer mode" network, the "telephone transfer mode" network, ATM and the "next generation" network, the capabilities of ATM, ATM as an "asynchronous" technology, problems addressed by ATM, ATM solutions, the ATM cell, ATM cell structure.

UNIT - IV

ATM Network Concepts and Architecture: ATM's position in the OSI reference model, B-ISDN protocol reference model, ATM functions and layers, ATM signaling principles, ATM performance, merging voice, audio, data and video, ATM traffic control, ATM operation and maintenance, ATM reference configurations. The ATM Protocol Stack: The lower layers, fiber-based networks, fiber-based network advantages, fiber modes, ATM physical layer media, ATM transmission convergence sub layer.

UNIT - V

The ATM Protocol Stack: The ATM layer, ATM switching principle, ATM OAM functions, signaling, ATM technology components, upper layers, ATM adaptation layer functions, ATM services.

832 COMPUTER SECURITY

UNIT - I

Introduction, fundamental concept of cryptosystems, historical review of classical ciphers, cryptanalytic attacks and crypto-system security, modern cryptosystems, authentication, digital signatures, and ID-based cryptosystem, zero-knowledge interactive proofs.

UNIT - II

Number Theory: Congruence, Fermat's Theorem, Wilson's Theorem, Chinese Remainder Theorem, and simultaneous congruence.

UNIT - III

Data Encryption Standard (DES), key schedule, encipherment, decipherment, S-box analysis & design, inter-symbol dependencies.

UNIT - IV

Stream cipher systems, synchronous stream ciphers, self-synchronizing ciphers, and error propagation.

UNIT - V

Public key cryptosystems, public key distribution system, RSA cryptosystem, and RSA authentication scheme.

833 SYSTEMS ANALYSIS AND DESIGN

UNIT - I

The Information Systems Analyst: The business and its uses as a system end-use, the beneficiaries of Information systems, modern Information Systems, functions of Information systems, transaction processing, management reporting, decision support systems, Information system components, a system development life cycle, essential principles for successful systems development.

UNIT - II

The Structured Methodologies for Systems Development: Structured programming, structured design, structured analysis, analyzing an information system, performance analysis, information and data analysis, economic analysis, control and security analysis, efficiency analysis, service analysis, surveying the feasibility of the project and studying the current information system, modeling a system, data flow diagrams, conventions and symbols using physical data flow diagrams for systems analysis, data modeling with logical E-R diagrams.

UNIT - III

Process Modeling with Logical Data Flow Diagrams: Data flow diagram conventions and symbols, defining logical data and information requirements in a project dictionary, project dictionary conventions and implementation using a project dictionary for systems analysis, defining logical policies and procedures in a project dictionary, traditional and prototyping approaches of designing an information system.

UNIT - IV

Designing Conventional Computer Files and Controls: Technical concepts for file design, designing and documenting conventional files, designing modern computer databases, designing and prototyping computer outputs and controls, designing and prototyping computer inputs and controls.

UNIT - V

Designing and prototyping the user interface and on-line terminal dialogues: Designing computer-based methods, procedures and controls, designing structured programs, implementing, and evaluating a new information system.

83C Distributed Computing Systems

UNIT - I

Motivations, objectives and characterization of distributed systems, distributed system architecture model, interprocess communication, layers, introduction, and hardware interconnection technology.

UNIT - II

Link level, hierarchy, IPC interface and end-to-end protocols, distributed control.

UNIT - III

Identifiers (naming) in distributed systems, protecting atomic transactions, synchronization.

UNIT - IV

Multiple copy update, applications and protocols, error recovery, hardware issues

UNIT - V

Hardware/software relationships in distributed systems, the National Software Works (NSW), Ethernet, Pup & Violet, and conclusion.

83H Principles of GUI Design

UNIT - I

Understanding the user interface, basic considerations in designing a proper interface, consistency, robustness of interface, user friendliness, feedback, providing default values.

UNIT - II

Identifying user tasks, methods of accomplishing tasks, necessity of performing tasks, event-driven programming, traditional programming, advantages of event-driven interfaces, and types of events in Windows.

UNIT - III

Menus, file menu, edit menu, menu structures, examples, undo and redo features, graying a menu entry, text buttons, graphic buttons and examples.

UNIT - IV

Principles of good dialog box design, rules of thumb for dialog box design, kinds of dialog boxes, handling controls and radio buttons, using radio buttons and check boxes.

UNIT - V

Use of list boxes and combo boxes, rules of thumb in setting up list boxes and combo boxes, varieties of list and combo boxes, examples.

SEMESTER – VII

731 RESOURCE MANAGEMENT

UNIT - I

Concept and scope of operations research (OR) – development of OR - phase of OR - models in OR linear programming, methods of solution – graphical and SIMPLEX methods of solution - variations – duality in LP - revised SIMPLEX method - applications for business and industrial problems.

UNIT - II

Integer Programming: Formulation – graphical representation - Gomory's cutting plane method - transportation and assignment problems, initial solution - methods of improving the initial solution - traveling salesman problems - dynamic programming - principle of optimality.

UNIT - III

Sequencing and Scheduling Problems: Job sequencing- n jobs through two machines, two jobs through m machines and n jobs through m machines, PERT and CPM techniques - critical path - normal and crash time - resource allocation - resource leveling and smoothing.

UNIT - IV

Inventory Problems: Deterministic model - costs - decision variables - economic order quantity – instantaneous and non-instantaneous receipt of goods with and without shortage - quantity discount - probabilistic inventory model - inventory systems - safety stock - reorder level (ROL), reorder point (ROP) determination.

UNIT - V

Maintenance and Replacement Problems: Models for routine maintenance and preventive maintenance decisions - replacement models that deteriorate with time and those fail completely.

732 COMPUTER GRAPHICS

UNIT - I

Introduction to Computer graphics - Display devices - Hardcopy devices - Interactive input devices – Display processors - Graphic adaptors - Basic function – Monochrome adaptors. Video monitors - Graphic software – Output primitives - Line and circle drawing algorithms – Attributes of output primitives.

UNIT - II

Two-dimensional transformation, clipping and windowing, clipping algorithms, segmented display files, display file compilation, modeling and modeling transformations.

UNIT - III

Interactive input methods - physical devices – logical classification of input devices - interactive picture construction techniques - input functions.

UNIT - IV

Three dimensional concepts, methods of 3D representation, 3D transformations, viewing, 3D clipping, hidden, surface and hidden-line elimination, shading and coloring methods, basic modeling concepts and modeling methods.

UNIT - V

Computer graphics applications, CAD/CAM, image processing, VLSI, games graphs and charts animation, introduction of Graphics and Kernel system (GKS), binding language for GKS, programming examples using GKS, PHIGS.

733 SYSTEM SOFTWARE

UNIT - I

Introduction, system software, machine structure, hypothetical computer model, instruction set, existing computer systems, segmentation concepts, internal operation.

UNIT - II

Intel 80386 architecture, addressing modes, instruction set with examples, MASM, assembler directive, programming examples using MASM on an IBM PC, interrupt services in MASM programs.

UNIT - III

Assemblers: functions, machine dependent and independent features, assembler design symbol table, macro processors, functions, and features design issues, implementation examples.

UNIT - IV

Loaders and linkers, basic functions, different schemes, design issues.

UNIT - V

Compilers, software tools, editors, interpreters, program generators, interactive debugging system, subroutine and parameter passing.

734 COMPUTER NETWORKS

UNIT - I

Introduction: The uses of computer networks, network structure, network architectures, the OSI reference model, services, network standardization, example networks, the physical Layer, the theoretical basis for data communication, transmission media, analog transmission, digital transmission, transmission and switching, ISDN, and terminal handling.

UNIT - II

The Medium Access Sub layer: Local and metropolitan area networks, the ALOHA protocols, local area network protocols, IEEE STANDARD 802 for LANs, fiber optic networks, satellite networks, packet radio networks, LAN controller for Ethernet and Token Ring, the data link layer, data link layer design issues, error detection and correction, elementary data link protocols, sliding window protocols, protocol performance, protocol specification and verification.

UNIT - III

The Network Layer: Network Layer design issues, routing algorithms, congestion control algorithms, inter-networking, IP protocol.

UNIT - IV

The Transport Layer: Transport layer design issues, connection management, UDP/TCP/IP Protocol. The Session Layer: Session layer design issues, remote procedure calls.

UNIT - V

The Presentation Layer: Presentation layer design issues, data compressions techniques, cryptography. The Application Layer: Design issues, file transfer, access and management, electronic mail, virtual terminals, other applications, network management, study of SNMP protocol.

73A ARTIFICIAL INTELLIGENCE

UNIT - I

Introduction: The AI problems and techniques, AI programming languages, introduction to LISP, list manipulations, functions, predicates and conditionals, input output and local variables, interaction and recursion, lists and arrays, introduction to PROLOG.

UNIT - II

Knowledge Representation: Syntax and semantics, properties of coefficients, conversion to casual form, inference rules, resolution principle, introduction to predicate logic, inter maintenance systems, default reasoning, predicate completion and circumspection, modal and temporal logics, fuzzy logic and natural language computations.

UNIT - III

Probabilistic Reasoning: Baye's Probabilistic references and Dempster-Shafer theory and heuristic methods, structured knowledge, introduction to graphs, frames and related structures.

UNIT - IV

Knowledge Organization and Manipulation: Breadth first search, depth first search, rendering and retrieval techniques, and frame problems.

UNIT - V

Expert System Architecture: Rule base architecture, non-production system architectures, knowledge system and building tools, knowledge acquisition concepts, types of learning, general learning model, performance measures, learning by induction, the INDUCE system.

73B COMPILER DESIGN

UNIT - I

Programming Language Grammar: Definition of programming languages, lexical and syntactic structure of a language, elements of a formal language grammar, derivation, reduction and syntax trees, ambiguity, context free grammars, capabilities of a context free grammar, regular expressions.

UNIT - II

Lexical Analysis: Role of a lexical analyzer, finite automata, regular expressions to finite automata, minimizing the number of states of DPA, implementation of a lexical analyzer, illustrations.

UNIT - III

Parsing Techniques: Parse trees, left most and right most parsing techniques, top down and bottom up parsing, handles, shift reduce parser, recursive descent parser, operator precedence and predictive parsers, automatic parsing techniques, LR grammars, LR parsing canonical collection of LR (O) items, construction of ACTION and GO TO tables, introduction to SLR canonical and LALR parsing.

UNIT - IV

Syntax Directed Translation: Syntax directed translation schemes, semantic actions, implementation, intermediate code generation, three address codes, quadruples and triples, parse trees and syntax trees, methods of translating assignment statements, expressions control statements, array references, procedure calls, declarations, case statements and record structures, symbol tables and error handling, representation of information in symbol tables, data structures for symbol tables, errors, lexical phase errors, and syntactic phase errors.

UNIT - V

Code Optimization and Code Generation: Principal sources of optimization, loop optimization, the DAG representation of basic blocks, introduction to code generation.

SEMESTER – VI

631 ENGINEERING ECONOMICS AND MANAGEMENT

UNIT - I

Basic economic concept - importance of economics in engineering - economic and technical decisions – demand and supply - factors influencing demand - elasticity of demand - demand forecasting - competition.

UNIT - II

Actual cost and opportunity cost - marginal cost – incremental cost and sunk cost. Fixed and variable cost - short-run, long-run cost - cost output relationship - price fixation – pricing policies - pricing methods, break even analysis.

UNIT - III

Nature of management and its process - contribution of Taylor and Fayel to management - functions and principles of management - types of organizations – organization charts and manuals - industrial ownership - types, formation, merits and demerits - management by objective, management by exception and Management Information System.

UNIT - IV

Plant location - factors - decision - plant layout - types, procedure and techniques - material handling - principles, equipments and selection - plant maintenance - objective, types and techniques.

UNIT - V

Production, productivity, economic growth and standard of living - factors affecting productivity - role of work study - human factor - method study - objective and procedure - charting and photographic techniques - SIMO chart - principles of motion economy - work measurement – stop watch time study - rating concept and systems – allowances – work sampling.

632 OPERATING SYSTEMS

UNIT - I

Generations and history of operating systems – performance factors utilization - throughout response time - multiprogramming and time sharing concepts - process states - state transition - PCB - suspend and resume – interrupt processing - job and processor scheduling - levels, objectives and criteria for scheduling - pre-emptive and non-preemptive scheduling - interval timer - priorities – deadline scheduling - FIFO - round robin - quantum size – SJF - SRT - HRT scheduling - Multilevel feedback queries.

UNIT - II

Storage organization - management strategies – contiguous and non-contiguous storage allocation - fixed partition multiprogramming - variable partitions – swapping, virtual storage, multilevel organization, block mapping, paging segmentation, paging/segmentation systems – page replacement - locality, working sets - demand paging - anticipatory paging - page release - page size – program behavior under paging.

UNIT - III

File systems, data hierarchy, blocking and buffering, file organization, queued and basic access methods – file characteristics - file system - allocating and freeing space, file descriptor - access control matrix - user classes – back up and recovery - database systems. Security - password protection - security kernels - OS Penetration, disk scheduling - seek optimization - rotational optimization - system considerations.

UNIT - IV

Parallel processing - Par begin - Par end - mutual exclusion - critical section - implementing mutual exclusion primitives - Dekker's algorithm - test and set instruction – semaphores process synchronization with semaphores – producer consumer relationship - counting semaphores. Communication between computers - elements of computer networks - network operating systems.

UNIT - V

Monitors - resource allocation with monitors - ring buffer - readers and writers - Ada - multi tasking – Rendezvous - accept - producer - consumer - select – deadlock Conditions - prevention - avoidance - Bankers algorithms - detection and recovery - performance measurement - monitoring and evaluation - UNIX operating system – basics and files - permissions - directory - hierarchy - piping - filtering - shell variable - shell programming – system utilities.

633 SYSTEM MODELLING AND SIMULATION

UNIT - I

Introduction to simulation: Advantages and disadvantages of simulation, areas of application, systems and systems environment, components of a system, discrete and continuous systems, model of a system, type of models, discrete - event system simulation, steps in a simulation study. Simulation examples: simulation of queuing systems, simulation of inventory systems, and other examples of simulation, concepts in DESS, programming languages for DESS, FORTRAN, GASP, SIMSCRIPT, GPSS, SIAM, summary and comparison of simulations.

UNIT - II

Statistical Models in Simulation: Review of terminology and concepts, useful statistical models, discrete distributions, continuous distributions, process, empirical distributions. **Queuing Models:** Characteristics of queuing systems, queuing notation, transient and steady state behavior of queues, long run measures of part of queuing systems, steady state behavior of infinite population Markovian models, steady state behavior of finite population models.

UNIT - III

Inventory Systems: Measures of effectiveness, inventory policies, deterministic systems, probabilistic systems, simulation in inventory analysis, random number generation, properties of random numbers, generation of pseudo-randomness, techniques for generating randomness, tests for randomness. Random variate generation: Inverse Transform technique, direct transformation for the normal distribution. Convolution method. Acceptance - Rejection technique.

UNIT - IV

Input Data Analysis: Data collection, identifying the distribution, parameter estimation, goodness-of fit tests, bivariate data, verification and validation of simulation models, model building, verification and validation, verification of simulation models, calibration and validation of models.

UNIT - V

Output Analysis for a Single Model: Stochastic nature of O/P data, types of simulations with respect to O/P analysis, measures of performance and their estimation, O/P analysis for terminating simulations, O/P analysis for steady state simulations. Comparison and evaluation of alternative system designs: comparison of two and several system designs, statistical models for estimating the effect of design alternatives.

634 DATA BASE MANAGEMENT SYSTEM & CLIENT/SERVER COMPUTING

UNIT - I

Introduction: Definition, need for a DBMS, uses of a DBMS, advantages, history. DBMS Concepts and Architecture: Introduction to data models, schemes, architecture, languages and environment. Conceptual Modeling: Entity - Relationship concepts, attributes, domains, keys, foreign keys, ER diagram, naming. Physical Storage Structures: Secondary storage devices, files, operations. File organization – sequential, direct, indexed, B-trees, Inverted lists.

UNIT - II

Data Models: Relational models - order, tuple, keys, and relational algebraic operations - set operations, select, project, join division operation, hierarchical data models - parent child relationships, occurrence trees, data definition and manipulation, network models - structures, sets, constraints on insertion and retention. Special sets - user work area, currency indicators, DML commands. Relational languages: SQL - data definition, queries in SQL, update statements, views, and indexing, relational calculus - tuple calculus, well formed formula, specifications, quantifiers, QBE - Data retrieval, update, conditions, aggregate operators, directory.

UNIT - III

Relational Data Base Design: Functional dependencies, anomalies, rules, axioms, equivalence of sets, minimal representation, normal forms, first, second, third and Boyce Codd algorithms for conversion, dependency preservation - multivalued dependencies and fourth normal form, single-system image, client server computing, mainframe - centric client-server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client-server development tools, advantages of Client-Server Computing.

UNIT - IV

Components of Client/Server Applications: The client, client services, request for service, RPC, Windows services, fax/print services, Windows services, remote boot services, other remote services, utility services and other services. Dynamic Data Exchange, Object Linking and Embedding, Common Object Request Broker Architecture. The server, detailed server functionality, the Network Operating System. Available platforms, the server operating system, components of client - server applications - connectivity, communications interface technology, interprocess communication, wide area network technologies, network management, client/server systems development software.

UNIT - V

Client/Server Systems Development: Hardware, hardware/network acquisition, PC-level processing units, Macintosh, notebooks, UNIX workstation, X-terminals, server hardware, data storage, magnetic disk, mirrored disk, RAID-disk array, tape, optical disks, CD-ROM, WORM, erasable optical, Network Interface Cards, token ring, Ethernet, FDDI, CDDI, power protection devices, UPS, surge protectors, client/server systems development - service and support. Systems administration, availability, reliability, serviceability, software distribution, performance, network management, help desk, remote systems management, security, LAN and network management issues. Client/server systems, development, training, training advantages of GUI applications, systems administrator training, database administrator training, end-user training, the future of client-server computing, enabling technologies, the transformational systems.

635 INTERNET CONCEPTS & PROGRAMMING

UNIT - I

The Net and its features, establishing your own connection, main Internet features, e-mail, new/groups, FTP, Telnet, Gopher; browsing the WWW. Modems: Speed/time continuum. Communications software: shareware; Internet's finding tools, Archie; Gopher commands, TCP/IP, non-Unix systems, main FTP commands, Internet Hunt, processing files, compression and compression software, processing a file, sounds & images, animation.

UNIT - II

Pictures, graphics & binary file via newsgroups, Quickshot, automatic decoding, graphics viewers, converter and paint programs, and graphics resources on the Net.

UNIT - III

Internet resources, library card catalogs, newsgroups & mailing lists, online reference works, Rice University Gopher, Library of Congress Marvel Gopher, Gopher Jewels.

UNIT - IV

HTML, CGI programming, establishing web services, Bitnet. Creating one's own web home page.

UNIT - V

Java programming.

636 SOFTWARE ENGINEERING & STANDARDS

UNIT - I

Evolving Role of Software: Crisis in the software industry, software myths, software life cycle, prototyping, project management, estimation, risk analysis, scheduling, metrics for software productivity and quality.

UNIT - II

Software Reusability: Lines of code and function point estimation, system analysis, feasibility study, economic analysis, technical analysis, requirements analysis, software prototyping, Specification.

UNIT - III

Structured Analysis: Data flow diagrams, object-oriented concepts, object-oriented analysis, Entity-Relationship diagrams, design fundamentals, refinement, modularity, information hiding, cohesion, coupling, object-oriented design concepts.

UNIT - IV

Software Quality Factors: Software quality indices, McCabe's Complexity metric, White box testing, Black box testing, software testing strategies, software configuration management.

UNIT - V

CASE: Taxonomy of Case Tools, Case tools for project management, programming, testing, documentation, design, programming and testing - Software quality assurance - SEI, CMM, ISO 9000 for software standards - TICKIT, 6 Sigma (IBM Standard).

SEMESTER – V

531 NUMERICAL METHODS

UNIT - I

Empirical laws and curve fitting - the linear law – laws reducible to the linear law - method of group averages - principles of least squares - fitting a straight line – fitting a parabola - fitting an exponential curve - fitting a curve of the form $Y=Ax+B$ - calculations of the sum of the squares of the residuals - method of moments - Relation between the roots and the coefficients of the equation $f(x) = 0$ - equations with real coefficients and imaginary roots - equations with rational coefficients and irrational roots - symmetric functions of the roots - transformation of equations - reciprocal equations - formation of equation whose roots are given.

UNIT - II

Solution of numerical algebraic and transcendental equations, the bisection method - iteration method - regular falsi method - Newton-Raphson method - convergence method - Homer's method - Gauss elimination method – inversion of a matrix using Gauss elimination method - method of triangularization, Crout's method - Gauss-Jacobi method - Gauss-Seidel method - Relaxation method.

UNIT - III

Finite differences: First and higher order difference-forward differences and backward differences - properties of operator - differences of a polynomial - factorial polynomials –error propagation in difference table - operator E – relation between A and E and A and 0 - summation of series- interpolation - Newton backward interpolation formula - equidistant terms with one or more missing values – Gauss forward interpolation formula - Gauss backward interpolation formula - Bessel's formula - Laplace Everett's formula.

UNIT - IV

Interpolation with unequal intervals - divided differences- Newton's divided difference formula - Lagrange's interpolation formula - inverse interpolation - numerical differentiation and integration - Newton's forward and backward differences to computer derivatives - derivatives using Stirling formula - the Trapezoidal rule - truncation error - Romberg's method - Simpson's one third rule - Simpson's rule - truncation error - difference equations with constant coefficients - non-homogeneous linear difference equations with constant coefficients.

UNIT - V

Numerical solution of ordinary differential equations – power series approximations - solution by Taylor series - Picard's method of successive approximations- Euler's method - improved and modified Euler method - Runge–Kutta methods - predictor-corrector methods – Numerical solutions of partial differential equations – difference quotients - classification of partial differential equations of their second order - Laplace's equation and its solution by Liebmann's process - solution of Poisson's equation - solution of parabolic and hyperbolic equations – solution by the method of relaxation.

532 OBJECT ORIENTED PROGRAMMING

UNIT - I

Fundamentals of Object-Oriented Design: Data abstraction, encapsulations, classes, inheritance and polymorphism, class hierarchies, designing an object-oriented system, identifying the classes. Assigning attributes and behavior, finding relationship between classes, arranging classes into hierarchies: a design example.

UNTT - II

A First Look at C++: Using streams for input and output. C++ enhancements to c, default function arguments, placement of variable declarations, the scope resolution operator, "Const" qualifier, overloaded function. References: References as aliases, references and pointers - similarities and differences, references as return values.

UNIT - III

Introduction to Classes: Declaring and using classes, class members, creation and destruction of objects, accessing data members, returning a reference, "Const" objects and member function, classes and dynamic memory allocation, new, delete operators, "this" pointer, static members, friends, array of class objects.

UNIT - IV

Inheritance and Polymorphism: Derived class and base class, derived class constructors, overriding member functions, public and private inheritance, virtual functions, polymorphism, multiple inheritance, and classes within classes.

UNIT - V

Operator Overloading: Overloading unary operator, overloading binary operator, data conversion, Microsoft foundation classes, strings, files, data structure classes.

533 DIGITAL SIGNAL PROCESSING

UNIT - I

Linear Shift-Invariant Systems: Review of the theory of linear shift - invariant systems, Fourier transform of a sequence (Discrete-Time Fourier Transform - DTFT), frequency response or transfer function of an LSI system, frequency response of first and second order systems, realization structures, direct forms-I & II, cascade and parallel forms.

UNIT - II

DFT and FFT: Discrete convolutions - linear and circular, sectioned convolutions, Discrete Fourier Transform (DFT) and its properties, relationship between Z-transform, DTFT and DFT. Introduction to radix-2 Fast Fourier Transform (FFT), decimation-in-time radix-2 Fast Fourier Transform (FFT), decimation-in-frequency radix-2 FFT, computation of inverse DFT through FFT, Fortran programs for FFT.

UNIT - III

Finite-Impulse Response (FIR) Filters: Magnitude response and phase response of digital filters, linear phase response, design techniques for FIR filters - Fourier series method and frequency sampling method. Linear phase designs: Windows, Rectangular, hamming, Hamming and Kaiser.

UNIT - IV

Infinite - Impulse Response (IIR) Digital Filters: Review of the properties of Butterworth and Chebychev's filters of the continuous-time type. IIR digital filter design from continuous-time filters using impulse-invariance technique and bilinear transformation.

UNIT - V

Finite Word-Length Effects in Digital Filters: Fixed-point arithmetic, effect of quantization of the input data due to finite word-length, coefficient inaccuracy, product round off, need for scaling, zero-input limit-cycle oscillations, limit cycle oscillations due to overflow of adders, table-lookup implementation to avoid multiplications.

534 PRINCIPLES OF DATA COMMUNICATIONS

UNIT - I

Introduction: A communications model - data communications - data communication networking - standards making organizations - data transmission: concepts and terminology - analog and digital data transmission – transmission impairments - transmission media.

UNIT - II

Data Encoding: Digital data, digital signals, encoding schemes – evaluation factors - digital data, Analog signals - need for modulation - modulation methods – amplitude modulation - angle modulation - comparison.

UNIT - III

Digital Data Communication Techniques: Asynchronous and synchronous transmission – error detection techniques – parity checks – cyclic redundancy checks – error correction codes – forward and backward error corrections – interfacing between DTE and DCE – characteristics of interface. Interfaces: RS232C – RS449/422-A/423-A/ X.21, V.35

UNIT - IV

Data Link control: Need for data link control – line configurations: topology duplicity and line discipline – flow control – sliding window protocol – error control: error detection – ARQ – bit oriented link control – necessity – protocols – HDLC, ADCCP, LAP-B, SDLC – character-oriented link control – binary synchronous communications – their categories – limitations, serial controller 85C30

UNIT - V

Multiplexing: Advantages – types of multiplexing – FDM – Synchronous TDM – Statistical TDM or Asynchronous TDM – study of their characteristics and carrier systems.

535 EXPERT SYSTEMS

UNIT - I

What are expert systems – expert systems as a major faculty of artificial intelligence – definition – characteristics – architectural description – description of various modules.

UNIT - II

Knowledge base-methods of representing knowledge in knowledge base – production rules - semantic nets – frames, inference engine, brute force search techniques – depth first and breadth first search – heuristic search – various heuristic search techniques.

UNIT - III

Stages in the development of expert systems – characteristics of problem chosen for expert system development, application areas of expert systems - advantages of using expert systems-problems in present day expert systems.

UNIT - IV

Certainty factor calculations in expert systems - MYCIN'S & PROSPECTOR'S certainty factor calculation methods - qualitative study of a few expert system shells like EMYCIN.

UNIT - V

Study of Expert systems like MYCIN, RI, PROSPECTOR.

536 MULTIMEDIA

UNIT - I

Introduction: What is Multimedia? CD-ROM and multimedia, multimedia in business, in school, at home etc, stages of a multimedia project: The Multimedia Team.

UNIT - II

Multimedia Hardware Macintosh and Windows Production Platforms: The Multimedia PC Platform. Hardware Peripherals; SCSI, NCI, memory and storage devices, input devices, output hardware, communication devices.

UNIT - III

Multimedia Software: Basic tools, word processors and spreadsheets, presentation tools, authorizing tools, card- and-page based authoring tools, icon-based and time-based authorizing tools.

UNIT - IV

Multimedia Building Blocks: Text, sound, Midi versus digital Audio, preparing MIDI files, audio file formats, MIDI under windows, audio Recording.

Images: Multiple monitors, bitmaps, vector drawing, 3-D, drawing, color, image file formats, animation, video standards, recording formats, video compression.

UNIT - V

Project Planning, estimating, proposals, designing multimedia, delivering multimedia, producing a CD.

SEMESTER – IV

431 MATHEMATICS - IV

UNIT - I

Fourier Series: Euler's formula, Dirichlet's condition, Convergence, Change of intervals, odd and even functions, Half-range series, RMS value, Parse Val's formula, complex- form of Fourier series, harmonic analysis.

UNIT - II

Fourier Transforms: Infinite Fourier transforms – Fourier integral theorem. Sine and cosine transforms, properties, Inversion theorem, finite Fourier transform, sine and cosine transforms, convolution theorem, Parse Val's identity, transforms of derivative.

UNIT - III

Laplace Transforms: Definition, transform for standard functions, properties, transform of derivatives and integrals, transform for the type $t f(t)$, $f(t)/t$, inverse Laplace transform, convolution theorem, transform for periodic functions, unit step functions and unit impulse function.

UNIT - IV

Application of Transforms: Application of Fourier and Laplace transform to ordinary differential equations with constant coefficients, integral equations, simultaneous differential equations with constant coefficients.

UNIT - V

Z-Transforms: Z-transform of elementary sequences, properties, impulse and unit step function, solution of Z-transform using power series method, partial fraction method, Z-transforms of difference equations, initial and final value theorems.

432 MICROPROCESSORS AND ASSEMBLY LANGUAGE PROGRAMMING

UNIT - I

Microprocessor Architecture: Internal architecture of 8085 microprocessor - Functions of various internal blocks and signals - driving x_1 and x_2 inputs - concepts of multiplexing microcomputer system - input and output devices and memory - example of 8085 based minimum system - brief introduction to the architecture of z80 and 6800.

UNIT - II

Instruction Set of 8085 and Assembly Language Programming: Addressing modes - instruction classification and format - types of instructions - arithmetic, logical, data transfer, branch, stack, I/O and machine control instructions - instruction timings and operation status - instruction cycles, machine cycles and clock states - fetch, execute, overlap - assembly language programming - brief introduction to assembler directives.

UNIT - III

Memory Interfacing: Semiconductor memory and its types - static and dynamic RAM, ROM, EPROM, EEROM, and NOVRAM - interfacing SRAM, DRAM, EPROM - timing of RAM and ROM signals.

UNIT - IV

Data Transfer Schemes: Methods of data transfer - programmed data transfer schemes namely synchronous, asynchronous and interrupt driven methods - 8085 interrupts - hardware and software interrupts – enabling, disabling and masking of interrupts - pooling and vectoring - DMA method of data transfer - types of DMA - basic concepts of serial I/O - software controlled asynchronous I/O using SID and SOD lines.

UNIT - V

Interfacing Peripherals and Applications: Parallel I/O interfacing - Basic concepts - I/O ports using latches and buffers - memory mapped I/O and I/O mapped I/O - interfacing output displays and input keyboards – 8212 device and its use as address latch - basic concepts of programmable I/O - 8155/8156 - 8255 PPI – brief introduction of 8251 device - designing a microcomputer system - Interfacing A/D and D/A converters.

433 COMMUNICATION ENGINEERING

UNIT - I

Methods of electromagnetic wave propagation – frequency spectrum, modulation techniques (principles only) need for modulation - amplitude and angle modulation (FM & PM) - mathematical equations - spectra - side bands - bandwidth - power relations - modulation index – phaser diagram - comparison of AM, FM, and PM - SSB - advantages - sampling theorem - analog pulse modulations - PAM and PTM (PPM and PDM or PWM) digital pulse or coded

modulations - PCM. PDM - Properties like spectra, waveforms, BW and SNR - CW modulation for digital signals – ASK, COK, FSK, PSK multiplexing systems for pulsed and CW modulations, TDM and FDM - comparison of features and merits.

UNIT - II

Modulation Methods or Modulators: Generation of AM waves - linear modulations. Collector, Base and Emitter modulation - Square - Law modulations: Diode and balanced modulators - suppression of carrier - SSB generation methods - generation of FM waves - reactance modulator method (direct method) - Armstrong method (indirect method) - conversion FM to PM and PM to FM waves – generation PAM, PPM and PWM waves - conversion of PWM wave to PPM wave.

UNIT - III

Demodulation Methods or Detectors: Demodulation of AM waves - linear detectors, synchronous and envelope detectors - performance comparison. Demodulation of FM waves, slope detector, balanced slope detector, Foster-Seely discriminator, ratio detector, demodulation of PAM, PPM, PWM, PCM, PDM waves, errors.

UNIT - IV

Communication System: Transmitters and receivers – Class C RF amplifier - Class B push-pull linear amplifier - low-level and high level modulation systems - their comparison - AM transmitter - SSB transmitter - ISB transmitter – FM transmitter - Direct and Armstrong transmitter – Straight receiver (TRF) Super heterodyne AM receiver – communication receiver - SSB receivers - diversity reception - FM receivers.

UNIT - V

Communication Services (Elementary treatment only) **Radar:** Basic radar system - radar range equation – pulsed radar systems. **Television:** Picture elements - transmission and reception of picture information - motion picture - horizontal and vertical scanning frequencies - TV transmitter - TV receiver - TV channels - satellite communication - read - orbit - satellite altitude - transmission path - its loss – Satellite system. **Fiber Optical Communication:** Need - principles of light transmission in a fiber - optical fiber communication system - optical fiber - light sources - photo detectors - advantages.

434 COMPUTER ORGANIZATION & ARCHITECTURE

UNIT-I

Evolution of computers - generations of computer systems - different types of computers - characteristics of Von Neumann architecture - limitations of computer systems - parallel computer structures. Microprogramming - instruction formats - addressing and instruction types of Intel 8088/80286/80386 Motorola 6800/68020/68030 architectures.

UNIT - II

Principles of linear pipelining - classifications of pipeline processors - interleaved memory organizations – instruction end arithmetic pipelines - design examples - vector processing requirements - characteristics of vector processing.

UNIT - III

Multiprocessor architecture - functional structures – loosely coupled multiprocessors - tightly coupled multiprocessors - processor characteristics for multiprocessing - inter-connection networks - time-shared, crossbar switch and multiport memories and multistage networks for multiprocessors - classification of multiprocessor operating system. Arithmetic logic unit, control unit, memory, I/O devices, and buses and interfaces.

UNIT - IV

Central Processing Unit (ALU and Control Units): **AL Unit:** construction - integer representation – binary half adder - full adder - parallel binary adder – addition and subtraction in a parallel arithmetic element - full adder design - BCD adder - positive and negative BCD number - shift operation - basic operations - logic operations - multiplexer - high speed arithmetic. **Control Unit:** Construction of an instruction word - instruction cycle and execution cycle - organization of control registers - instruction formats - controlling arithmetic operations - typical sequence of operations - instruction set - register transfer language - Microprogramming: Micro instruction format - simple micro program – microprogramming applications.

UNIT - V

Memory. I/O devices and Buses and Interfaces: **Memory:** Random Access memories - memory organizations, memory operations - comparison - decoders – dimensions of memory access - connecting memory chips to computer bus - random access memories - static and dynamic ROM, RAM and EPROM memories - mass storages - hard disk, floppy disk, magnetic tape, tape cassettes, cartridges, magnetic bubble, CCD and optical storage devices – computer word structure - storage hierarchies - digital recording techniques - virtual and cache memory. **I/O Devices:** Input Media: Keyboard, punched tape, punched cards, character recognition (MICR & OCR) - output devices - CRT, flat panel display - printers - teleprinter (TTY). **Buses and Interfaces:** Interconnecting system components - interrupts and DMA- interfacing - buses - I/O addressing techniques – memory mapped I/O - interrupts in I/O systems - standard buses - interfacing of key board and printer.

435 STATISTICAL METHODS

UNIT - I

Sample spaces - events - probability, axiom – conditional probability, independent events, Baye's formula, random variables, functions of random variables and their probability distribution - the distribution function - marginal and conditional distribution.

UNIT - II

Discrete distribution: Binomial, Poisson, Geometric and Hyper geometric. Continuous distribution: Uniform, Normal, Exponential, Gamma, and Erlang. Expectation - Moment generating function.

UNIT - III

Markov's inequality, Chebychev's inequality, correlation, regression, multiple and partial correlation.

UNIT - IV

F, chi-square distribution. Test of statistical hypothesis.

UNIT - V

Estimation and sampling-point and interval estimate – time series analysis - trend and seasonal variations - Box-Jenkin's prediction models - properties of estimators, maximum likelihood estimation, confidence intervals for mean, variance and proportion, quality control - x, y, p, np, c-charts.

436 DESIGN OF ALGORITHMS

UNIT - I

Introduction: What is an algorithm, writing structural programs in pseudo codes, analyzing algorithms, time complexity, space complexity, elementary data structures, stacks, queues, trees, sets, heaps, graphs, heap sort.

UNIT - II

Divide and Conquer: The general method, binary search, finding the k^{th} maximum and minimum, merge sort, quick sort, selection and Strassen's matrix multiplication.

UNIT - III

The Greedy Method: The method, optimal storage on tape, knapsack problem, job sequencing problem with deadline, optimal merge pattern.

UNIT - IV

Basic search and traversal: The technique, code optimization, BFS, DFS traversals, backtracking - the general method, the 8-queen problem, branch and bound - the method, 0/1 knapsack problem.

UNIT - V

NP - hard and NP - complete problems, basic concepts, Cook's theorem, some NP - Hard problems, graph problems and NP-hard scheduling problem.

SEMESTER – III

331 MATHEMATICS - III

UNIT - I

Complex Variable: Analytic functions - necessary and sufficient conditions for $f(z)$ to be analytic, C-R equation in polar coordinates-Harmonic functions, orthogonal system, construction of analytic functions given real and imaginary parts, conformal transformations-standard transformations - standard transformation like $z+c$, cz , $z+1/z$. $\sin z$, $\cos z$, $\sinh z$, $\cosh z$ and bilinear transformations.

UNIT - II

Complex Integration: Cauchy's integral theorem. Integral formula with proof, Taylor's and Laurent's series, singularities, residues, calculus of residues - evaluation of definite integrals.

UNIT - III

Permutation, Combination, Discrete Probability: Introduction, the rules of sum and product, permutation, combination, generation of permutation and combinations, discrete probability, conditional probability, information and mutual information.

UNIT - IV

Combinatorics: Combination of sets - finite and infinite sets - countability and uncountability, binary relations, properties of binary relations, equivalence relations and partitions, partial ordering and lattices, anti-chains, application of relational model in databases, functions and the pigeon hole principle, bijective functions - Mathematical induction - Principles of inclusion and exclusion.

UNIT - V

Combinatorial numbers: Multinomial numbers, Stirling numbers of I and II kind, partition numbers and their applications, Bells number, generating series-algebra of formal power series, recursive functions.

332 PROGRAMMING IN 'C'

UNIT - I

Introduction: History of C - ANSI standard - nature of C - program development, functions - anatomy of a C function - formatting source files, the preprocessor, the main () function - the printf() function - The scanf() function.

UNIT - II

Scalar Data Types: Declarations - different types of integers - different kinds of integer constants - floating point of types - initialization - mixing types - explicit conversions - casts - enumeration types - the void data type – typedefs - finding the address of an object - introduction to pointers.

Control Flow: Conditional branching - the switch statement - looping -nested loops - the break and continue statements - the goto statement - infinite loops.

UNIT - III

Operators and Expressions: Procedure and associativity - unary plus and minus operators - binary arithmetic operators - increment and decrement operators - comma, relational and logical operators - bit - manipulations and bitwise assignment operators, cast, sizeof, conditional and memory operations.

Array and Pointers: Declaring arrays, storing arrays in memory - initializing arrays - pointer arithmetic, passing pointers as function arguments - accessing array elements through pointers - passing arrays as function arguments - sorting algorithms - strings, multidimensional arrays, arrays of pointers, pointers to pointers.

UNIT-IV

Storage Classes: Fixed Vs automatic duration, scope, global variables, the register specifier, different storage classes, dynamic memory allocation,

Structures and unions: Structures, linked lists, unions, enum declarations.

Functions: Passing arguments, declarations and calls, pointers to functions, recursion, the main () function, complex declarations.

UNIT-V

The C Preprocessor: Macro substitution, conditional compilation, include facility, line control, input and output, streams, buffering, the <stdio.h> header file, error handling, opening and closing a file, reading and writing data, selecting an I/O Method, unbuffered I/O, random access.

333 ELECTRICAL CIRCUITS

UNIT - I

Circuit Analysis: Network graphs - concept of branch, link, tree and cotree - Kirchoff's laws - matrix representation and solution of DC and AC networks - node and loop basis - dual networks - series and parallel resonance circuits - bandwidth and selectivity of resonant circuits.

UNIT - II

Network Theorems and Transformations: Voltage and current source transformations - star and delta transformations - superposition, reciprocity, substitution, Thevenin, Norton, Tellegen and maximum power transfer theorems – statement and applications.

UNIT - III

Response of Electric Circuits: Concept of complex frequency – pole-zero plots - frequency response of RL, RC and RLC circuits - transient response of RL, RC and RLC series and parallel circuits - free response - step and sinusoidal responses - natural frequency, damped frequency, damping factor and logarithmic decrement - response of circuits for non-sinusoidal periodic inputs.

UNIT - IV

Coupled and Three Phase Circuits: Coupled circuits - coefficient of coupling - self and mutual inductance - analysis of coupled circuits - single and double tuned coupled circuits - coefficient of critical coupling – analysis - frequency response of tuned coupled circuits - three phase circuits - balanced circuits - star and delta connected loads - unbalanced circuits - solution of unbalanced star and delta connected loads - power measurement by two wattmeter method.

UNIT - V

Two Port Network and Filters: Driving point and transfer impedance/admittance - voltage and current ratios of two port networks - admittance, impedance, hybrid, transmission and image parameters for two port networks - impedance matching, pi and T network - passive filters as a two port network - characteristics of ideal filters – low pass and high pass filters.

334 ELECTRON DEVICES & CIRCUITS

UNIT - I

Electron Ballistics and Semiconductor Basics: Motion of charged particle in uniform magnetic and electrostatic fields - electric and magnetic deflection of beam in CRO - focusing of electron beam - qualitative study of motion under concurrent fields with E and H in parallel and with E and H perpendicular to each other - review of extrinsic semiconductor - drift and diffusion currents – thermal generation of minority carrier - Hall effect - Photo conductive cell (LDR).

UNIT - II

Junction Diodes: Energy band diagram - PN Junction - junction diode - Volt-ampere characteristic - ratings - transition and diffusion capacitance - Varactor diode - Avalanche and Zener break down - Zener diode – Tunnel diode - PIN diode - clipper and clamper circuits using diodes - Photo diodes - Photovoltaic cell - LED and LCD – Voltage multiplier circuit.

UNIT - III

Bipolar Junction Transistors: Principle of transistor action - current components - cutoff, active and saturation regions - input and output characteristics - CE, CB and CC configurations - small signal and large signal beta – transistor break down and ratings - Phototransistor - different methods of transistor biasing - bias stabilization - bias compensation - thermal run away problem - thermal resistance and capacitance concepts - use of heat sink - thermal calculations.

UNIT - IV

FET and Other Devices: Constructional features and characteristics of JFET and MOSFET - depletion and enhancement modes - VVR Operation of FET – handling precaution for MOSFET - biasing of FET circuit – construction and characteristics of UJT - fabrication and characteristic of four layer devices such as SCR, Triac and Diac.

UNIT - V

Small Signal Model for Electron Devices: Circuit model for semiconductor diode, Zener diode - h-parameter model for BJT - evaluation of h-parameters - circuit model for FET - high frequency effects -high frequency model for FET - hybrid pi model for BJT - alpha and beta cut off frequencies - analysis of a given electronic circuit using circuit model for the device - delay time, rise time, storage time and fall time - response of a diode - transistor as a switch.

335 INTRODUCTION TO DATA STRUCTURES

UNIT - I

Algorithms for data structures - specifics of PSEUDO – data types, constants, variables and expressions, program modules in PSEUDO, logic and control structures in PSEUDO - linked lists, arrays, singly linked lists - insertions and deletions - variations on linked list structures, dummy headers, circular linked lists, doubly linked circular list - fixed length string method - workspace/index table method - processing efficiency considerations of the workspace/index table method - garbage collection - linked list method.

UNIT - II

Circular implementation of a queue - linked list implementation of a queue, priority queues - stacks - array implementations of a stack, linked list implementation of a stack, parsing and evaluation of arithmetic expressions using stacks, postfix, prefix and infix notations - converting infix expressions to postfix,

evaluating postfix expressions – recursion, Towers of Hanoi problem, recursive algorithms, implemented non-recursively, recursion, stacks and backtracking, the 8 Queen's problem.

UNIT - III

Tree structures, binary trees, implementation of binary trees, linear representation of a binary tree, linked representation of a binary tree, binary tree traversals, pre-order, in order, post order traversals of a binary tree - deletion algorithm for lists maintained with binary trees, threaded binary trees, insertions into a binary tree, height - balanced trees, AVL - Rotations, general trees.

UNIT - IV

Implementing a multidimensional array - sparse matrices and generalized Dope vector implementation - linked list implementation of sparse matrix, graphs and networks, implementation of graphs – the adjacency matrix, depth-first search, breadth-first search, networks - minimum spanning tree - the shortest path algorithm - Topological ordering.

UNIT - V

Sorting - internal sorts, the bubble sort, the insertion sort, the selection sort, the shell sort, the quick sort, the heap sort, external sorting or file sorting, the merge sort. Search strategies - quantity dependent search techniques, sequential search, binary search, binary tree search - density dependent search techniques, construction of hashing functions, collision processing - indexed search techniques - indexed sequential search technique, Binary tree indexing, B-tree indexing, Tree indexing.

336 PRINCIPLES OF DIGITAL ELECTRONICS

UNIT - I

Number Systems and Codes: Review of binary, octal and hexadecimal representations of numbers and their conversion, binary, arithmetic, conversion algorithms, weighted binary codes, non-weighted binary codes, error-detecting and error-correcting codes, alphanumeric codes.

UNIT - II

Boolean Algebra: Introduction to Boolean algebra, the AND, OR and NOT operations, laws of Boolean algebra, minimization of Boolean expressions, Boolean expressions and logic diagrams, universal building blocks, negative logic.

Combinational Logic: Truth tables and maps, sum-of-products and product-of-sums, map reduction hybrid functions, incompletely specified functions, multiple - output minimization, variable - entered maps, tabular minimization, analysis of logic schematics, syntheses of combinational functions.

UNIT - III

Logic Function Realization with MSI Circuits: Multiplexers, de-multiplexers, decoders and code converters, arithmetic circuits, adder, number complements, subtracting positive binary numbers with adders, signed number addition and subtraction.

UNIT IV

Synchronous Sequential Circuits: Basic latch circuits, debouncing switch, flip-flops, truth table and excitation table, shift registers - asynchronous and synchronous counters, shift counters.

UNIT-V

Asynchronous Sequential Circuits: State diagrams, state table reduction, problems of asynchronous circuits.

Note: Semesters I and II are common to all engineering branches, and consist of basic engineering subjects.

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