

SE-COMPUTERS SEMESTER –III

APPLIED MATHEMATICS - III

(1) Complex Variables:

Functions of complex variables, Continuity (only statement), derivability of a function, Analytic-, Regular function. Necessary condition for $f(z)$ to be analytic (statement of sufficient conditions), Cauchy-Ricmann conditions in polar co-ordinates. Harmonic function, orthogonal trajectories. Analytical and Milne-Thomson method to find $f(z)$ from its real or imaginary parts.

Mapping: Conformal mapping, linear, bilinear mapping with geometrical interpretation.

(2) Fourier Series and Integrals :

Orthogonal and orthonormal functions, expression for a function in a series of orthogonal functions, sine and cosine function and their orthogonal properties, Fourier series, Dirichlet's theorem (only statement), Periodic function with period 2π and $2l$, Even and Odd functions. Half range sine and cosine series, Parseval's relations.

Complex form of Fourier series : Introduction to Fourier Integral.

(3) Laplace Transform :

Function of bounded variation:

Laplace transforms of $1, t^n, e^{at}, \sin at, \cos at, \sinh at$ and $\cosh at, \operatorname{erf}(t)$. Linear property of L.T., First shifting theorem, Second shifting theorem. Expressions (with proofs for)

$$L\{t^n (f(t))\}, L\left\{\int f(t)/t\right\}, L\left\{d^n/dt[f(t)]\right\}.$$

Unit step functions, Heaviside, Dirac functions, Periodic functions and their Laplace Transform.

Inverse Laplace Transforms:

Evaluation of Inverse LT, partial fraction method, Convolution theorem.

Applications to solve initial and boundary value problem involving ordinary diff. Equation with one dependant variable.

(4) Matrices :

Types of matrices, Adjoint of a matrix, Inverse of a matrix, Elementary transformations of a matrix, Linear dependence and independence of rows and columns of a matrix over a real field, Reduction to normal form, partitioning of a matrices.

Systems of Homogeneous and non-homogeneous equations, their consistency and solutions.

ELECTRONICS DEVICES AND CIRCUITS

(1) Review of transistors (BJT and FET) :

BJT principle, Biasing, Simple remodel, Voltage and Current amplification. CE, CB, CC amplifier configurations, FET principle, Biasing, FET amplifier configurations.

(2) Differential Amplifier :

Introduction, Circuit configurations, DC and AC analysis, FET differential amplifier, Current mirror circuit.

(3) Operational Amplifier :

Block diagram representation, Ideal op-amp, Equivalent circuit, Op-amp with negative feedback, Open-loop configurations, Frequency response, Compensating networks, Popular 741 op-amp specifications and performance characteristics.

(4) Operational Amplifier Applications :

Basic op-amp applications, Instrumentation amplifier, AC amplifier, Analysis of integrator and differentiator circuits.

(5) Active Filters :

First order and second order low pass, high pass Butterworth and band pass filter configurations.

(6) Oscillators and Converters :

Oscillation principle, Phase shift oscillator, Wein bridge oscillator, Voltage controlled oscillator.

(7) Comparators and Converters :

Op-amp used as basic comparator, Zero crossing detector, Schmitt trigger comparator, Voltage limiter, Comparator specifications and performance characteristics. Analog to digital converter and digital to analog converter principles, Practical A-D converter with binary weighted resistors, AD808 and 809, A-D and D-A converter specifications and performance characteristics.

(8) Voltage Regulators :

Fixed voltage series regulators, Variable voltage regulator using IC 723, Principle of switching regulator, PWM IC voltage regulator specifications and performance characteristics, Practical power supply circuits.

(9) Specialized IC applications :

555 timer IC and its use as monostable and astable multivibrator, Specifications and performance characteristics.

University Recommended Text Books :

- (1) Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI publishers.
- (2) D. Roy Choudhary and Shall Jain, "Linear Integrated Circuits", New Age International publishers.
- (3) Robert L. Boylestad and Louis Nashelsky "Electronics Devices and Circuit theory", Eighth edition, Pearson Education Asia.
- (4) J.M. Fiore, "Op Amps and Linear Integrated Circuits", Thomson Learning.

University Recommended References :

- (1) Sergio Franco, "Operational Amplifiers and Analog Integrated Circuits", McGraw Hill International Edition.

DIGITAL LOGIC DESIGN AND APPLICATIONS

(1) Number Systems :

Decimal, Binary, Octal and Hexadecimal number system and conversion, Binary weighted codes, signed number binary order, 1's and 2's complement codes, Binary arithmetic.

(2) Boolean Algebra :

Binary logic functions, Boolean laws, Truth tables, Associative and distributive properties, DeMorgan's Theorems, Realization of switching functions using logic gates.

(3) Combinational Logic :

Switching equations, Canonical logic forms, Sum of product and product of sums, Karnaugh maps, Two, three and four variable Karnaugh maps, Simplifications of expressions, Quine McCluskey minimization techniques, Mixed logic combinational circuits, Multiple output functions.

(4) Analysis and Design of Combinational Logic :

Introduction to combinational circuit, Code conversion, Decoder, Encoder, Priority encoder, Multiplexers as function generators, Binary adder, Subtractor, BCD adder, Binary comparator, Arithmetic and logic units.

(5) Sequential Logic :

Sequential circuits, Flip-flops, Clock and edge triggered flip-flops timing specification, counters : asynchronous and synchronous, Counter design with state equations, Registers : Serial in serial out shift registers, Tristate register, Register transfer timing considerations.

(6) Sequential Circuits :

State diagrams and tables, Transition table, Excitation table and equations, Examples using flip-flops, Simple synchronous and asynchronous sequential circuit analysis, Construction of state diagram and counter design.

(7) Programmable Logic :

Programmable logic devices, Programmable logic arrays and programmable array logic, Design using PAL, Field programmable gate arrays.

(8) Digital Integrated Circuits :

Digital circuit logic levels, Propagation delay times, Power dissipation, Fan out and fan in., Noise margin for popular logic families, TTL, LSTTL, CMOS, and ECL integrated circuits and their performance comparison, Open collector and Tri-state gates and buffers.

University recommended Text Books :

- (1) John M. Yarbrough, "Digital Logic", Thomson Learning.
- (2) T.C. Bartee, "Digital Computer Fundamentals", McGraw Hill.
- (3) D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH.

University Recommended References :

- (1) John P. Uyemura, Brookes, "Digital Systems Design", Cole Publishing Co.
- (2) M. Morris Mano, "Digital Logic and Computer Design", PHI.
- (3) A.B. Marcontz, "Introduction to Logic Design", McGraw Hill.

ELECTRICAL NETWORK

(1) Solutions of Network with Independent Sources.

(2) Linear Graphs :

Introductory definition; The incidence matrix A; The loop matrix B, Relationship between sub matrix of A and B cutsets and cutset matrix, Fundamental cutsets and fundamental Tiesets, Planner graphs, A & B matrices, Loop, Node, Node pair equations, Duality.

(3) Network Equation in the Time Domain :

First second order differential equations initial conditions; Evaluation and analysis of transient and steady state response to step, ramp, impulse and sinusoidal input functions.

(4) Laplace Transform :

Laplace transform and its application to analysis of network for different input functions described above.

(5) Network Functions :

Driving points and transfer functions; two port network, Open circuit and short circuit parameter; Transmission parameter. Hybrid parameter, Chain parameter; Interconnection of two port network, Cascade connection, Series and parallel permissibility of connection.

(6) Representation of Network Functions :

Pole zeros and natural frequencies, Location of pole, Even and Odd pairs of a function; Magnitude and Angle of function; The delay function; All pass and minimum phase function, Net change in angle, Azimuth polynomials, Ladder network, Constant resistance network, Maximally flat response Chebyshev response, Calculation of a network function from a given angle and real part Bode method.

(7) Fundamentals of Network Synthesis :

Energy function passive, reciprocal network, The impedance function, Condition on angle, Positive real function; Necessary and sufficient conditions; The angle property of a positive real function; Bounded real function; The real part function; Reactance functions; Realization of reactance functions; Ladder form of network, Azimuth polynomials and reactance function; Impedance and admittance of RC network under network realization; Resistance inductance networks.

University Recommended Text Books :

- (1) Franklin F Kuo, 'Network analysis and synthesis', PHI
- (2) M E Venvalkenberg, "Network analysis", Prentice Hall (I) Ltd, third edition
- (3) William Hayt and Jack Kemmerly, "Engineering Circuit analysis", TMH

University Recommended References :

- (1) Nolman Balbanian, T A Bickkart, Sundarm, 'Electrical Networks', John Wiley and Sons

DISCRETE STRUCTURES

(1) Set Theory :

Sets, Venn diagrams, set membership of tables, Laws of set theory, Partitions of sets, Power set

(2) Logic :

Propositions and logical operations, Truth tables, Equivalence, Implications Laws of logic, Mathematical induction and Quantifiers

(3) Relations, Digraphs and Lattice :

Relations, paths and digraphs, Properties and types of binary relations, Manipulations of relations, closures, Warshall s algorithm, Equivalence and partial order relations, Posets and Hasse diagram, Lattice

(4) Functions and Pigeon Hole Principle :

Definitions and types of functions, inactive, surective and bljective, Composition, identity and inverse, Pigeon hole principle

(5) Graphs: Definition Paths and circuits Eulenan, Hamiltoman, Planner graphs

(6) Groups:

Monoids, Semi groups, Groups, Product and quotients of algebraic structures, Isomorphism, homomorphism, automorphism, Normal subgroup, Codes and group codes

(7) Rings and Fields : Rings, Integral domains and fields, Ring Homomorphism

(8) Generating Functions and Recurrence Relations :

Series and Sequences, Generating functions, Recurrence relations, Applications Solving Differential equations, Fibbonacci, etc

University Recommended Text Books :

- (1) Joe Mott, Abraham Kandel and Theodore Baker, 'Discrete Mathematics for Computer Scientists and Mathematician', Second Edition, PHI
- (2) K D Joshi, "Foundations of discrete mathematics", New Age International publication

University Recommended References :

- (1) Aln Doerr and K. Levasseur, "Applied Discrete Structure for Computer Science", Galgotia,

- (2) Seymour Lipschutz and Marc Lars Lipson, "2000 Solved Problems in Discrete Mathematics",
- (3) C.L. Liu, "Elements of Discrete Mathematics", McGraw Hill.
- (4) Trembley and Manohar, "Discrete Mathematical Structures", McGraw Hill.

DATA STRUCTURES

(1) **Introduction in C** : Static and Dynamic Structures; Unions; Strings; Files; Macros;

(2) **Lists** : Abstract Data Types;

Stacks : ADT; Representation; Operations; Example; Applications;

Queues : ADT; Representation; Operations; Circular and Priority Queues; Examples; Applications; Other Lists and their implementations.

(3) **Linked Lists** :

ADT; Dynamic Memory and Pointers.

Dynamic Representation : Insertion and Deletion of Nodes; Linked Stacks and Queues; Linked Lists as Data Structures; Array Implementation of Linked List; Comparison of Dynamic and Array Representations.

(4) **Recursion** :

Recursive Definition and Processes; Recursion in C; Writing Recursive Programs; Efficiency in Recursion.

(5) **Binary Tree** :

Binary Tree Operations and Applications;

Binary Tree Representations ; Node Representation; Array Representation; Binary Tree Traversals; Threaded Binary Tree; The Huffman Algorithm; *Representating Lists in Binary Trees* : Finding and Deleting Elements; Tree Represented Lists; *Applications of Trees* : Expression Trees; Game Trees;

University Recommended Text Books :

(1) Y. Langsam, M. J. Augenstein and A.M. Tannenbaum, "Data Structures Using C and C++", Prentice Hall India, Second Edition.

(2) R. Kruse, "Data Structures and Program Design", Prentice Hall India. Third Edition.

(3) R.F. Gilberg, "Data Structures : A Pseudocode Approach with C", Thomson Learning.

University Recommended Reference Books :

(1) Tremble and Sorenson, "Data Structures and Algorithms", Tata McGraw Hill.

(2) M.A. Weiss, "Data Structures and Algorithm Analysis in C++", Addison Wesley Longman, International Student Edition.

(3) A. Aho, J.E. Hopcroft and J.D. Ullman, "Data Structures and Algorithms", Addison Wesley, Low Price Edition.