

Syllabus for M. Phil./Ph. D. Entrance in the Discipline of Electronics

Unit – I :

Electronic Transport in semiconductor, PN Junction, Diode equation and diode equivalent circuit. Breakdown in diodes, Zener diodes, Tunnel diode, Semiconductor diodes, characteristics and equivalent circuits of BJT, JFET, MOSFET, IC fabrication-crystal growth, epitaxy, oxidation, lithography, doping, etching, isolation methods, metalization, bonding, Thin film active and passive devices

Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh analysis, Zero and Poles, Bode Plots, Laplace, Fourier and Z – transforms. Time and frequency domain responses. Image impedance and passive filters. Two – port Network Parameters. Transfer functions, Signal representation. State variable method of circuit analysis, AC circuit analysis, Transient analysis.

Unit-II :

Rectifiers, Voltage regulated ICs and regulated power supply, Biasing of Bipolar junction transistors and JFET. Single stage amplifiers, Multistage amplifiers, Feedback in amplifiers, oscillators, function generators, multivibrators, Operational Amplifiers (OP AMP) – characteristics and Applications, Computational Applications, Integrator, Differentiator, Wave shaping circuits, F to V and V to F converters. Active filters, Oscillators, Schmitt trigger, Phase locked loop, A/D and D/A converters

Unit – III:

Introduction of High – level Programming Language, Introduction of data in C. Operators and its precedence, Various data types in C, Storage classes in C, Decision-making and forming loop in program, Handling character, Arrays in C, Structure and union, User defined function, Pointers in C, Advanced pointer. Pointer to structures, pointer to functions, Dynamic data structure, file handling in C, Interfacing to external hardware via serial/parallel port using C, Applying C to electronic circuit problems. Logic families, flip – flops, Gates, Boolean algebra and minimization techniques, Multivibrators and clock circuits, Counters-Ring, Ripple. Synchronous, Asynchronous, Up and down shift registers, multiplexers and demultiplexers, Arithmetic circuits, Memories.

Unit – IV :

Architecture of 8085 and 8086 Microprocessors, Addressing modes, 8085 instruction set, 8085 interrupts, Programming, Memory and I/O interfacing, Interfacing 8155, 8255, 8279, 8253, 8257, 8259, 8251 with 8085 Microprocessors, Serial communication protocols, Introduction of Microcontrollers (8 bi t) – 8031 / 8051 and 8048.

Characteristics of solid state power devices – SCR, Triac, UJT, Triggering circuits, converters, choppers, inverters, converters, Three phase controlled rectifier; Switch mode power supply; Uninterrupted power supply.

Optical sources – LED, Spontaneous emission, Stimulated emission, Semiconductor Diode LASER, Photodeteetors – p – n photodiode. PIN photodiode, Phototransistors, Optocouplers, Solar cells, Display devices, Optical Fibres-Light propagation in fibre, Types of fibre, Characteristic parameters, Modes, Fibre splicing, Fibre optic communication system-coupling to and from the fibre, Modulation, Multiplexing and coding, Repeaters, Bandwidth and Rise time budgets.

Unit – V:

Maxwell's equations, Time varying fields, Wave equation and its solution, Rectangular waveguide, Propagation of wave in ionosphere, Poynting vector, Antenna parameters, Half-wave antenna, Transmission lines, Characteristic of Impedance matching, Smith chart, Microwave components-T, Magic – T, Tuner. Circulator isolator, Direction couplers, Sources-Reflex Klystron, Principle of operation of Magnetron, Solid State Microwave devices; Basic Theory of Gunn, GaAs FET, Crystal Defector and PIN diode for detection of microwaves.

Basic principles of amplitude, frequency and phase modulation, Demodulation, Intermediate frequency and principle of superheterodyne receiver, Spectral analysis and signal transmission through linear systems, Random signals and noise, Noise temperature and noise figure. Basic concepts of information theory, Digital modulation and Demodulation; PM, PCM, ASK, FSK, PSK, Time-division Multiplexing, Frequency-Division Multiplexing, Data Communications-Circuits, Codes and Modems. Basic concepts of signal processing and digital filters.

Unit – VI:

Transducers – Resistance, Inductance Capacitance, Piezoelectric, Thermoelectric, Hall effect, Photoelectric, Thermogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed and sound temperature, pressure, flow, humidity, thickness, pH, position.

Measuring Equipment-Measurement of R, L and C, Bridge and Potentiometers, voltage, current, power, energy, frequency / time, phase, DVMS, DMMs, CRO, Digital storage oscilloscope, Logic probes, Logic State Analyser, Spectrum Analyzer.

Open – loop and close-loop control system. Error amplifier, on – off controller, Proportional (P), Proportional-Integral (PI), Proportional – Derivative (PD), PID controllers, Dynamic Behaviour of control systems-servomechanism characteristics parameters of control systems-Accuracy, Sensitivity, Disturbances, Transient response, Stability, Routh-Hurwitz criterion, Bode plots, Nyquist criterion, Controlling speed. Temperature and position using analog / digital control circuits.

Syllabus for Ph.D. Entrance in Computer Science 2023

Unit I

Input/Output Statements, Expressions, Operator Precedence, Loops, conditional statements, Arrays, Pointers, Structures and unions, functions, File Handling in C and C++ , Classes, Operator overloading: Function overloading: function overriding, Inheritance: Single & Multiple, Polymorphism, Static and Dynamic Binding, Templates.

Stack, Queues, Linked Lists, Trees, Heap, Hashing, Graphs, Sorting and Searching Algorithms, Logic, predicate calculus, rules of Logic, sets, functions, mathematical Induction, principles of counting, the Pigeon-Hole Principle, Permutation, combinations, repetitions, discrete probability, recurrence relations, solving recurrence relations, Relations and Its types, Equivalence relations, Partially Ordered Sets (Posets, Lattices, Graph theory, spanning trees, minimal spanning trees, Transitive closure, Warshall's Algorithms, Eulerian and Hamiltonian graphs, graph coloring,

Unit II

Asymptotic notations, Time and Space Complexity, Substitution method, Iteration method, Recursion, Randomized Algorithms, Divide and Conquer, Greedy Method, Knapsack problem, Dynamic programming, All pair shortest paths, Traveling salesman problems. Backtracking, Queen Problem, Branch and Bound, Lower boundary theory P and NP problems. NP hard and NP complete problems. Finite Boolean algebra, Monoids, semigroups.

Computer Architecture and organization, Register organization, addressing modes, memory architecture, Computational Models, programming language and architecture, Basic Computational models, Granularity, typing . Computer architecture, Description of Computer Architectures. Parallel architectures and pipelining.

Unit III

System Software, Assemblers, Compilers, Operating System, Process Management, Memory Management, Virtual Memory, Paging, Segmentation, Virtual Memory Design Techniques, File Management, Multiprocessor Systems.

Numerical Techniques Errors, Types of Equations, Algorithms to Compute Roots of Equation, Algorithms to Solve Systems of Linear Algebraic Equations, Algorithms to solve Ordinary Differential Equations, Algorithms to find integrals.

Unit IV

Elementary Database Concepts. Hierarchical, Relational, Network and O Database Architectures and their comparison. Data Modeling. Relational model, algebra and Constraints.

SQL. Software engineering, Software Engineering Challenges, Software standard, (CMMI), process patterns software process models, Process Planning, Estimation, COCOMO Model, Project Scheduling and Risk management, Coupling and Cohesion, CASE. Networks, LAN, MAN & WAN architectures. OS Reference Model Architecture, TCP/IP architectural model.

Autonomous systems and Internetwork Routing. Classful IP addresses. Subnetting, IP Multicasting. Sliding window protocol, Internet Protocol(IP), Internet control protocols: ICMP, ARP and RARP. Routing algorithms: Interior(OSPF), Exterior(BGP). Transport Layer: UP and TCP concepts.