

TAMILNADU PUBLIC SERVICE COMMISSION

ELECTRONICS / ELECTRONICS AND COMMUNICATION ENGINEERING

(Degree Standard)

CODE : 403

UNIT – I SEMICONDUCTOR THEORY AND ELECTRONIC DEVICES

Intrinsic and Extrinsic semiconductors, Energy Bands, Diffusion and Drift current densities. PN junction diode, current equation, Transition and Diffusion capacitances, Zener diode, Tunnel diode, Varactor diode, Photo diode, Schottky diode, LED, BJT, FET, JFET, MOSFET, UJT, SCR, DIAC, TRIAC.

UNIT - II CIRCUIT THEORY, SIGNALS AND SYSTEMS

Circuit analysis: Kirchoff's laws, Nodal and Mesh analysis, Network Theorems: Superposition, Thevenin, Norton, Miller and Reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform. Linear 2-port network parameters, Wye-Delta transformation.

Characteristics and classifications of Continuous and Discrete Time signals – CT signal analysis – Fourier Series, Fourier Transform and Laplace Transform. Sampling theorem, Discrete Time signal analysis – DTFT and Z-Transform. CT and DT systems – Impulse response and convolution, Frequency response, Transform domain analysis using FT, LT, DTFT and Z-Transform – Recursive and non-recursive systems.

UNIT-III ANALOG CIRCUITS

BJT, JFET, MOSFET amplifiers – Biasing analysis, Small signal analysis and frequency response, BJT and MOSFET multistage amplifiers: Differential, Darlington, Cascade and Cascode, Feedback amplifiers, Tuned amplifiers, RC and LC oscillators, Power amplifiers. Rectifiers and wave-shaping circuits, Operational amplifier characteristics and applications, CMRR, slew rate, waveform generators, active filters, timers, PLL, VCO, ADC, DAC, Regulators and Converters.

UNIT-IV CONTROL SYSTEMS

Control system components, Feedback, Transfer function, Transient and Steady state analysis of LTI systems, Frequency response, Bode, Polar and Nyquist plots, Routh-Hurwitz and Nyquist stabilities, Lag, Lead, Lag-lead compensation, State variable model.

UNIT – V COMMUNICATION SYSTEMS

Random Processes: Stationary process, Ergodic process, Auto correlation, Power spectral density, White noise, Filtering of random signals through LTI systems.

Analog Communication: Amplitude and angle modulation / demodulation, Spectral characteristics.

Noise: Thermal noise, Noise figure and Noise temperature.

Digital Communication: PCM, DPCM, ADPCM, DM, ADM, LPC.

Line coding schemes, Bandpass signaling: Binary and M-ary versions of ASK, PSK, FSK, BER and spectral characteristics. Principles of QAM, OQPSK, MSK, GMSK. Link budget calculations, Eye diagram, ISI, Symbol and carrier synchronization, Frame synchronization.

Information Theory and coding: Entropy, Mutual information, Channel capacity (AWGN), Source coding and Channel coding techniques.

UNIT-VI ELECTROMAGNETIC THEORY

Divergence, Stokes, Coulomb, Poisson and Laplace Equation, Ampere's law, Biot-Savart law, Gauss law for magnetic fields, Maxwell's equations, Displacement current, Uniform plane waves, Poynting vector.

Plane waves and properties: Reflection and refraction, Polarization, Phase and group velocity, Propagation through various media, Skin depth.

Transmission lines: Equations, Characteristic impedance, Impedance matching, Impedance transformation, S-parameters, Smith chart.

Rectangular and circular waveguides.

Dipole and monopole antennas, Linear antenna arrays.

UNIT-VII WIRELESS COMMUNICATION TECHNIQUES

Wireless channel characteristics, Frequency reuse, Channel assignment and handoff, Multipath effect, Spread spectrum, OFDM, Adaptive equalization, Rake receiver, Diversity techniques, MIMO systems.

UNIT – VIII DIGITAL SIGNAL AND IMAGE PROCESSING

DFT, FFT, Overlap and save methods, IIR filters: Butterworth and Chebyshev filters, Impulse invariant and Bilinear transformation methods, FIR filter: Linear phase design, Windowing techniques: Rectangular, Barlett, Hanning and Hamming, Digital Filter realization structures, Finite word length effects in IIR and FIR filters, Scaling, Decimation and interpolation, multirate signal processing.

Image enhancement: Contrast enhancement, Histogram equalization, Filtering. Image compression: JPEG. Video compression: Intra-frame / Inter-frame redundancy and motion estimation.

UNIT – IX DIGITAL CIRCUITS

Number representations: Binary, Integer and Floating point numbers, Combinational logic circuits, Boolean algebra, Minimization of functions using Boolean identities and Karnaugh map, Logic gates and their static CMOS implementations, Arithmetic circuits, Code converters, Multiplexers, Decoders.

Sequential circuits: Latches and flip-flops, Counters, Shift registers, Finite state machines, Propagation delay, Setup and hold time, Critical path delay.

Data converters: Sample and hold circuit, ADC and DAC.

Semiconductor memories: ROM, SRAM, DRAM.

Computer organization: Machine instructions, Addressing modes, ALU, Data path and Control unit, Instruction pipelining.

UNIT – X: DATA NETWORKS

OSI model, TCP/IP reference model, Data link layer: Framing, error and flow control, HDLC, P to P – Medium Access Control: Random and controlled access, Channelization. Network layer: IPV4 and IPV6, ARP and RARP, Network routing algorithms – Distance Vector routing, OSPF, Dijkstra's and Bellman Ford, Congestion control, Transport layer: TCP and UDP, Application layer: WWW, HTTP, FTP and TELNET.

Note: Medium of Instruction is English only