ANNAMACHARYA UNIVERSITY RESEARCH ADMISSION TEST (AURAT)-2024-25

04- ELECTRONICS AND COMMUNICATION ENGINEERING

UNIT-I NETWORKS, SIGNALS & SYSTEMS

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, 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.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

Discrete-time signals: DTFT, DFT, Z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

UNIT-II ANALOG ELECTRONICS

Semiconductors: Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors.

Carrier transport: Diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

Basics of Electronic Devices: P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

Diode circuits: clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: Biasing, AC coupling, small signal analysis, frequency response.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

UNIT-III DIGITAL ELECTRONICS

Number representations: Binary, integer and floating-point- numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, multiplexers, decoders.

Sequential circuits: Latches and flip-flops, counters, shift-registers, finite state machines.

Semiconductor memories: ROM, SRAM, DRAM.

Introduction of Microprocessor 8086: Architecture, addressing modes, instruction set, interrupts, Programming, Memory and I/O interfacing.

Introduction of Microcontrollers – 8051 for embedded systems, Architecture and register set of Microcontroller 8051, Addressing modes, Instruction set of 8051 – Data transfer instructions, Arithmetic instructions, Logic instructions, bit level and byte level control transfer instructions, 8051 assembly programming – stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication.

UNIT-IV <u>COMMUNICATIONS</u>

Analog communication: Amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers.

Information theory: Entropy, mutual information and channel capacity theorem.

Digital communication: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, Fundamentals of error correction, Hamming codes.

Optical communication: Optical sources - LED, spontaneous and stimulated emission, semiconductor Lasers, Detectors – PIN photodiodes, Avalanche photodiodes (APD), Optical fibers – attenuation and dispersion characteristics.

UNIT-V <u>ELECTROMAGNETICS</u>

Maxwell's equations: Differential and integral forms and their interpretation, boundary conditions, wave equation, 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.

Wave guides: Rectangular and circular wave guides,

Antennas: Antenna Parameters, principles, Dipole and monopole antennas, linear antenna arrays.