

M-52

Department: Electronics & Communication Engineering
Name of the Faculty: Faculty of Engineering and Technology
Name of the Program: M. Tech in Electronics & Communication Engineering

Important Instruction

1. Calculator and other Electronic gadgets are not allowed
2. Black / Blue Pen to be used.

Syllabus for M. Tech in Electronics & Communication Engineering Entrance Test

Networks: Network Graphs; matrices associated with graphs; incidence, fundamental cut set and fundamental

circuit matrices, Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin's and Norton's Theorem, maximum power transfer theorem, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.

Electronics Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion

current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, PIN and avalanche photo diode, Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twintub CMOS process.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode

circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers; single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators: criterion for oscillation.

Digital Circuits: Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL,

MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. MOSFET based digital circuits, CMOS inverter, CMOS NAND and NOR gates, transistor sizing, transmission gates. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor (8085): architecture, programming, memory and I/O interfacing.

Signal and systems: Definitions and properties of Laplace transform, continuous-time Fourier Transform, continuous-

time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform. DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, Signal transmission through LTI systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams.

Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control

systems and frequency response. Tools and techniques for LTI control system analysis: root locus, Routh-Hurwitz criterion.

Communication Systems: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis, super-heterodyne receivers; Implementation of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations, Basics of TDMA, FDMA and CDMA.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss and Stokes theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting Vector. Plane Waves: Propagation through various media, reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristics impedance; impedance transformation; Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

Electronic Instrumentation: Units and dimensions, characteristics of Instruments. Analog concepts of electronic measurement, Digital methods of measurements. Intelligent Instruments, Analog and Digital, Sensors and Transducers.