

Electronics & Communication Engineering Department
National Institute of Technology Srinagar

Syllabus for Ph. D Entrance Test Autumn (July) 2016 Session for E C E Department

Electric Circuits & 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 maximum power transfer, 3 phase and Wye-Delta transformation. Transient and Steady state analysis of AC and DC circuits. 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. Filters.

Signals and Systems: Definitions and properties of Laplace 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, group delay, phase delay. Signal transmission through LTI systems.

Electronic Devices & Circuits: 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, p-I-n and avalanche photo diode, Basics of LASER. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process. Small Signal Equivalent circuits of diodes, BJTs and MOSFETs. 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. Sinusoidal oscillators; criterion for oscillation.

Digital circuits: Boolean algebra, minimization of Boolean functions; logic gates; Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Microprocessor (8085): architecture, programming, memory and I/O interfacing.

Communications: 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 of these operations, super-heterodyne receivers; elements of hardware, realizations 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 for these schemes. Basics of TDMA, FDMA and CDMA. Wave propagation through various media.

Wireless Communication

Cellular concepts, frequency reuse, co channel interference, Cell splitting. Radio propagation characteristics; models for path loss, shadowing and multipath fading. Diversity techniques and Rake demodulator. Introduction to spread spectrum communication.

Computer Networks

Review of data communication techniques. Data transmission, line coding, error control coding. Switching . LAN topologies and protocols. MAC protocols, Routing and congestion control. Quality of Service. Network Security: Services, attacks and mechanisms. Cryptography: Secret and Public key. Hash functions, Digital Signatures

Computer Organization and Architecture:

Computer cycle control, CPU organization, Memory Organization, I/O organization, Pipelining

Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

It is also informed that

Written test shall be based on Multiple Choice Questions (MCQ)

For any queries please contact:

Office ECE Department

(2nd Floor) ECE New Block

Contact: 09796386602 (Office Hours Only)