M. Tech. Entrance Examination
Department of Electronics & Communication Engineering

1. **Electrical Circuits:** Nodal and mesh analysis. Network theorems: Superposition, Thevenin's and Norton's theorem, Maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis, Time domain analysis of RLC circuits, Solution of network equations using Laplace transform, Two-port network.

2. **Electronic 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, p-i-n and avalanche photo diode, Basics of LASERs.

3. **Analog Circuits:** Small Signal Equivalent circuits of diodes, BJTs, MOSFETs. Simple diode circuits, clipping, clamping, rectifier, Biasing and bias stability of transistor and FET amplifiers, Single-and multi-stage amplifier, differential and operational amplifier, feedback, and power amplifier, Simple op-amp circuits, Filters, Oscillators.

4. **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. ADCs, DACs.

5. **Signals and Systems:** 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, frequency response.

6. **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, transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. State variable representation and solution of state equation of LTI control systems.

7. **Electromagnetics Theory:** Vector calculus, Maxwell's equations, Wave equation, Poynting vector, Plane wave, reflection and refraction, phase and group velocity, skin depth, Transmission lines, Smith chart, Waveguides, Basics of Antennas, Antenna gain.

8. **Communication Systems:** Random signals and noise: probability, random variables, Probability density function, autocorrelation, power spectral density. Amplitude and angle modulation and demodulation systems, Elements of hardware realizations of analog communication systems, SNR for AM and FM, Fundamentals of information theory and channel capacity theorem. Pulse code modulation, differential PCM, digital modulation schemes: amplitude, phase and frequency shift keying schemes, matched filter receivers, Basics of TDMA, FDMA and CDMA and GSM.