

School of Electrical Sciences (Electronics and Communication Engineering)

Q-Exam subject & Syllabus

Subject Name: Digital Electronics

Syllabus: 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, 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 circuits, ADCs and DACs.

Reference Books:

1. S. Lee, "Digital Circuits and Logic Design," 1st Ed., Prentice Hall India
2. M. Morris Mano, "Digital Logic and Computer Design," 1st Ed., Prentice Hall, 1979, 15th Reprint 2013.

Subject Name: Signals and Systems

Syllabus: 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

Reference Books:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems," 2nd Ed., Pearson Prentice Hall, 2015.
2. S. Haykin and B. V. Veen, "Signals and Systems," 2nd Ed., Wiley India, 2007

Subject Name: Analog Electronics

Syllabus: Diode circuits: clipping, clamping and rectifiers. BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers. Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

Reference Books:

1. S. Sedra and K. C. Smith, "Microelectronic Circuits," Oxford University Press, India, 2005.
2. D. A. Neamen, "Electronic Circuits," Tata McGrawHill Education, 2006.

Subject Name: Analog and Digital Communication

Syllabus: Analog Modulation: Concept of Modulation, Amplitude modulation: Demodulation: Carrier Recovery in AM, coherent Demodulation, Envelope Detector, Demodulators, Superheterodyne Receiver; Angle Modulation: Frequency Modulation, Phase Modulation, Narrow Band Angle Modulation, Wideband FM, Modulators, Demodulators.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER

Reference Books:

1. S. Haykin, "Communication Systems," John Wiley & Sons, 5th Ed., 2009.
2. J. G. Proakis and M. Salehi, "Fundamentals of Communication Systems," Prentice Hall, 2004.

Subject Name: Electromagnetics

Syllabus: 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. Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

Reference Books:

1. J. D. Kraus and D. A. Fleisch, "Electromagnetics: with Applications," McGraw Hill, 1999.
2. W. H. Hayt, "Engineering Electromagnetic", 5th Ed., TMH, 1999

Subject Name: Semiconductor Devices

Syllabus: Semiconductor Fundamentals, Crystal Structure, Energy bands, Intrinsic and extrinsic semiconductors, Fermi Level, Carrier concentrations at thermal equilibrium, Carrier transport phenomenon: drift and diffusion, Scattering, Excess carriers in semiconductors: generation, recombination and injection of carriers, transient and steady state response. Physical description of p-n junctions, Transport equations, current-voltage characteristics, deviations from simple theory, small-signal ac analysis, metal-semiconductor junctions, BJT fundamentals, operation regions, BJT equivalent circuits and modelling frequency response of transistors. MOS structure, flat-band threshold voltages, MOS static characteristics, small signal parameters and equivalent circuit, charge sheet model, strong, moderate and weak inversion, short channel effects, scaling laws of MOS transistors, LDD MOSFET, NMOS and CMOS IC technology, CMOS latch-up phenomenon.

Reference Books:

1. Ben G Streetman, S K Banarjee, Solid State Electronic Devices, 6th edition, PHI India, New Delhi, 2007.
2. R S Muller, T.I.Kamins, Device Electronics for Integrated Circuits, 3rd edition, WileyIndia, New Delhi, 2012.