

Syllabus for M.S./Ph.D. Written Tests in Electrical Engineering, **IIT Tirupati**

I. Common areas of test (Section-1)

Basic Electronics: Diodes, Transistors, OP-AMPs, Digital Electronics, Flip flops.

Electrical Circuits: RLC circuits, Transient Analysis, First order and Second order circuits, AC Circuits, Application of Laplace Transform.

Signals & Systems: Classification of Signals & Systems and their properties, Fourier series, Fourier Transform, Laplace Transform, LCCDE.

Basic Mathematics: Matrix Algebra, Basic Calculus, Plotting functions, Finding Maxima & Minima.

II. Specific Areas (Section-2, stream-specific)

Stream 1: Microelectronics

Semiconductors at equilibrium, non-thermal equilibrium phenomenon; pn junctions, energy band diagram, static and dynamic characteristics; physics and characteristics of MOS capacitors; MOSFET-physics, characteristics and modelling; Hetero junctions; light-matter interactions; photo detectors; solar cells.

Stream 2: Instrumentation

Analog and digital circuits: - BJT and FET's, filters, amplifiers, log amplifiers, AD/DA converters. Principles of electric and magnetic measurements.

Stream 3: Communication (Wireless)

Probability: Axioms of probability, conditional probability, independence, Baye's rule, random variables, distribution functions, expectation and variance, multivariate normal distributions, transformations of random variables, sum of random variables, Chebychev's inequality, law of large numbers, central limit theorem.

Signals and Systems: Continuous and discrete time signals, signal energy and power, periodicity, even and odd signals, unit impulse and unit step signals, properties of systems (linearity, time-invariance, causality, stability, invertibility), LTI systems, convolution, Fourier Series and Fourier Transforms, Parseval's identity, Discrete Time Fourier Transform, and Z-transform.

Communication: Information theory: entropy, mutual information and source coding theorem, and channel coding theorem; Baseband and passband signals, up-conversion and down-conversion, sampling theorem, Different modulation techniques (QAM, PSK, QPSK, PAM, etc), Jointly Gaussian random variables, probability of error for AWGN channel, ML and MAP rules for decoding.