

Written Test details for admission in Spring 2025

Program: PhD (Electrical and Computer Engineering)

Pattern:

1. Part A (30 marks) is mandatory.
2. For Part B, choose any one of Sections I-V (40 marks) depending on your field of expertise.
3. Interview 30 marks

Question Paper Pattern and Syllabus:

Part A (30 marks) – Common for All disciplines

- Mathematics
- Aptitude (Verbal Aptitude, Quantitative Aptitude, Analytical Aptitude)
- Simple Programming (Python, C, C++ choice should be the students)
- Basic Electrical Engineering
- Signals and Systems

Part B (40 marks) – Program Specific sections- Can attempt any one based on your background

- Section I – courses relevant to research in Power electronics, Power Systems and Control Systems
- Section II – courses relevant to research in Communications (Digital Electronics, Basic Communication Systems, Random Process, Analog Communication, Digital Communication, Fundamentals of Error Correction)
- Section III – courses relevant to research in VLSI & ES (semiconductor devices and CMOS VLSI design)
- Section IV – courses relevant to research in Smart Grid and Storage Technology
- Section V – Anything else that is of interest to faculty and does not fall into the above four categories.

Part-A ; Syallabus:

(1) Basic Networks:

- KVL, KCL: Mesh and nodal analysis
- Network theorems: superposition, Thevenin's and Norton's, and maximum power transfer theorems: with both independent and dependent sources
- Transient and steady state circuit responses for R-L, R-C and RLC circuits with DC and AC excitation
- Parallel and Series Resonance
- Sinusoidal steady state analysis of AC circuits.

(2) Basic Electronics:

Small signal equivalent circuits of diodes, and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small-signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation, single-transistor and op-amp configurations. Boolean algebra, Combinational logic circuits, Synchronous sequential circuits, mealy and moore machines. static timing analysis, CMOS-based digital circuits.

(3): Simple Programming (Python, C, C++ choice should be the students)

(4): Aptitude

(5) : Mathematics

Calculus: Functions of single variable, limit, continuity and differentiability.

Vector Calculus: Gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, Stokes, Gauss and Green's theorems applications.

Ordinary Differential Equations: First order equation (linear and nonlinear), Second order linear differential equations with variable coefficients, Variation of parameters method, higher order linear differential equations with constant coefficients, power series solutions.

Partial Differential Equations: Separation of variables method, Laplace equation.