Written Test Pattern and Syllabus

1. Applicants who have a valid score card in national level exams like GATE/UGC-NET/CSIR-NET/NBHM, etc. are exempted from the written test. Such applicants are expected to produce the valid score card while reporting at the institute.

2. The Question Paper consists of two-parts. Part A consists of 50 Multiple Choice Type Questions, each carrying 1 mark. For every incorrect 1-mark question, 1/3 marks are deducted.

3. Part B consists of 10 Multiple Choice Type Questions, each carrying 5 marks. No negative marking for Part B questions.

4. The duration of the examination is 180 mins.

Syllabus for Test / Interview (PhD-Physics)

Electromagnetic Theory: Solutions of electrostatic and magnetostatic problems including boundary value problems; method of images; separation of variables; dielectrics and conductors; magnetic materials; multipole expansion; Maxwell's equations; scalar and vector potentials; Poynting vector, Poynting theorem.

Quantum Mechanics: Postulates of quantum mechanics; uncertainty principle; Schrodinger equation; Dirac Bra-Ket notation, linear vectors and operators in Hilbert space; one dimensional potentials: step potential, finite rectangular well, tunneling from a potential barrier, particle in a box, harmonic oscillator; two and three dimensional systems.

Solid State Physics: Elements of crystallography; diffraction methods for structure determination; bonding in solids; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids: nearly free electron and tight binding models; metals, semiconductors and insulators; conductivity, mobility and effective mass; Optical properties of solids; Kramer's-Kronig relation, intra- and inter-band transitions; dielectric properties of solid; dielectric function, polarizability, ferroelectricity; magnetic properties of solids; dia, para, ferro, antiferro and ferri-magnetism; superconductivity.

Electronics: Semiconductors in equilibrium: electron and hole statistics in intrinsic and extrinsic semiconductors; metal semiconductor junctions; Ohmic and rectifying contacts; PN diodes, bipolar junction transistors.