

## **Subject: Syllabus for written test for PhD entrance exam 2011-12**

### **1. Division of Electronics & Communication:**

1. Circuit Theory
2. Electronic Devices
3. Analog Electronics Circuits (including Linear Integrated Circuits)
4. Digital Circuits and Systems (including Microprocessors/Microcontrollers)
5. Signal and Systems
6. Digital Signal Processing
7. Control Systems
8. Communication Theory and Systems (including Microwave)
9. Electromagnetic Field Theory

### **2. Division of Computer Engineering:**

1. Programming
2. Data Structures and Algorithms
3. Computer architectures
4. Databases
5. Operating Systems

### **3. Division of Information Technology:**

1. Programming
2. Data Structures
3. DBMS
4. Operating System
5. Computer Architectures

### **4. Division of Instrumentation & Control Engineering:**

1. Basic Electrical Engg. & CKTs & Systems
2. Basic Electrical Machines
3. Basic Control Engg.
4. Basic Measurements & Instrumentation
5. Basic Computer Science
6. Basic Electronics

**5. A) Division of SAS (Physics):**

1. Solid State Physics

- \* Semiconductor Physics
- \* Dielectrics
- \* Metallic Conduction
- \* Superconductivity
- \* Magnet son

2. Fundamentals of Quantum Mechanics

- \* Schrodinger wave equation & its applications.
- \* DC Broglie Waves & Uncertainty principle.

3. Mathematical Physics

- \* Metrics
- \* Vector Algebra
- \* Numerical Methods

**5. B) Division of SAS (Phyisc): Green Building Technology, Energy & Environment Management:**

1. Green Building-Definitions, concepts & General principles.

2. Benefits of Green Buildings.

- \* Economic benefits of Green Building.
- \* Environmental benefits.

3. Using Natural materials.

4. Reclamation uses a range of solutions.

5. Elements of Green Building design.

- \* Sitting.
- \* Building orientation.
- \* Energy Efficiency.
- \* Material Efficiency.
- \* Water Efficiency.
- \* Occupant Health and Safety.
- \* Ventilation and Air Quality.
- \* Air Systems.
- \* Building Operation and Maintenance.
- \* Occupants Discipline and Green effect.

6. Disability Access.
  - \* Provisions for physically handicapped.
  - \* Physical human limits.
7. Efficient water management.
  - \* Waterless Urinals.
8. Green code for Architecture.
  - \* Environmental Architecture.
  - \* Ecological Building.
9. Smart Buildings.
  - \* Active Response to Environment.
  - \* Essential Requirements of Smart buildings.
  - \* Essential Provisions to be kept in the Design.
  - \* Energy Provision to be kept in the Design.
10. Energy Efficiency.
11. Informational Resources on Green Buildings.
12. United State Green Building concepts (USGBC).
13. Establishing Priorities with Green Building.
14. Other method of Employing Green Concepts.
  - \* Cork Flooring.
  - \* New Hard wood flooring.
15. Environmentally harmful material and methods.

**6. Division of Humanities and Social Sciences:**

1. Sociology of Science and Technology

History and nature of science and technology, science and technology as social institutions, Gender science and technology, science and technology based ethical issues, technological determinism, relationship between science and technology and social change.

2. Sociology of Education and profession and Globalization

Theories of education, professions, professional education and vocational learning, education, knowledge and globalization.

7. **Division of SAS (Mathematics):**

*Real Analysis:* Sequence and series of functions. Uniform convergence and its relation to continuity, differentiation. Riemann Integration, Measurable sets. Measurable functions and Lebesgue Integration.

*Complex Analysis:* Contour and Contour Integrals. The Cauchy and Goursat Theorem. The fundamental theorem of integration, The theorems of Morera and Liouville and some applications. Uniform Convergence, Taylor's Series, Laurent's series, Singularity, Zeros and Poles, Application of Taylor's and Laurent's Series. Isolated singularities and residues, The residue theorem. Evaluations of real integrals. The argument principle and Rouché's theorem.

*Vector Analysis:* The operators gradient, divergence and curl and their geometrical significance, Integration of vectors, Work done in vector fields, Green's, Stokes and Gauss divergence theorem.

*Algebra:* Group, Ring, Integral Domain, Field, Vector Space, Linear Dependence and Linear Independence, Linear Transformation, Matrix Representation, Rank & Nullity of a Transformation, Eigen values and Eigen vectors, Banach Space, Normed Linear Space, Inner Product Space.

*Ordinary Differential Equations:* General linear differential equations with constant coefficients, Operator D, Complementary function, particular integral, Wronskian, Simultaneous linear differential equations, Solution of differential equations in power series, Frobenius method.

*Partial Differential Equations:* First Order PDE's, Heat Equation, Wave Equation, Potential Equation.

*Numerical Methods:* (i) Solution of a system of linear equations: Gaussian Elimination and Gauss-Seidel Methods. (ii) Solution of Nonlinear equations: Bisection Method, Secant Method, Method of False Position, Newton-Raphson Method, Chebyshev Method, Rate of Convergence, System of nonlinear equations. (iii) Interpolation by polynomials: Divided difference, Error of the interpolating polynomial, Least square approximation, Piecewise linear and cubic spline interpolation. (iv) Numerical Integration: Composite Rules, Gaussian Quadrature formula, Error formula. (v) Numerical solutions of differential equations: Euler and Runge-Kutta methods, Multistep methods, and Predictor-corrector Methods, Order of convergence.