TIFR Exam - Syllabus and Pattern

Syllabus of Mathematics:

Stage I of the selection process is mainly based on mathematics covered in a reasonable B.Sc. course. This includes:

Algebra: Definitions and examples of groups (finite and infinite, commutative and non-commutative), cyclic groups, subgroups, homomorphisms, quotients. Group actions and Sylow theorems. Definitions and examples of rings and fields. Integers, polynomial rings and their basic properties. Basic facts about vector spaces, matrices, determinants, ranks of linear transformations, characteristic and minimal polynomials, symmetric matrices. Inner products, positive definiteness.

Analysis: Basic facts about real and complex numbers, convergence of sequences and series of real and complex numbers, continuity, differentiability and Riemann integration of real valued functions defined on an interval (finite or infinite), elementary functions (polynomial functions, rational functions, exponential and log, trigonometric functions), sequences and series of functions and their different types of convergence.

Geometry/Topology: Elementary geometric properties of common shapes and figures in 2 and 3 dimensional Euclidean spaces (e.g. triangles, circles, discs, spheres, etc.). Plane analytic geometry (= coordinate geometry) and trigonometry. Definition and basic properties of metric spaces, examples of subset Euclidean spaces (of any dimension), connectedness, compactness. Convergence in metric spaces, continuity of functions between metric spaces.

General: Pigeon-hole principle (box principle), induction, elementary properties of divisibility, elementary combinatorics (permutations and combinations, binomial coefficients), elementary reasoning with graphs, elementary probability theory.

Syllabus of Physics:

The questions in the written test (multiple choice type) and the interviews are distributed over the following areas:

- Classical Mechanics

- Mathematics relevant to Physics
- Electricity and Magnetism
- Quantum Mechanics; Heat
- Thermodynamics and Statistical Physics
- General Physics
- Modern Physics
- Electronics and Experimental Physics

Syllabus of Chemistry:

The questions are aimed at testing the basic understanding and knowledge in the areas of:

- Physical, organic
- Inorganic
- Analytical
- Electro and Quantum chemistry
- Biophysics
- Thermodynamics
- Spectroscopy (NMR, fluorescence, IR, UV and X-ray)
- Logic and statistics and mathematical methods

Syllabus of Biology:

According to official, the test will be extremely basic and cover topics in mathematics, physics, chemistry, and biology.

School of Technology and Computer Science

There are two streams in the School of Technology and Computer

Science:

1. Computer Science.

2. Systems Science.

Syllabus of Computer Science:

- Discrete Mathematics: Sets and Relations, Combinatorics (Counting) and Elementary Probability Theory, Graph Theory, Propositional and Predicate Logic.
- Formal Languages, Automata Theory and Computability.
- Data Structures and Algorithms: Arrays, Lists and Trees, Sorting and Searching, Graph algorithms, Complexity of problems and NP-completeness.
- Fundamentals of Programming Languages and Compilers: Control structures, Parameter passing mechanisms, Recursion, Parsing and type checking, Memory management.
- Operating Systems and Concurrency
- Switching Theory and Digital Circuits
- Theory of Databases

Syllabus of Systems Science:

- Engineering Mathematics: Complex Analysis, Linear Algebra, Elementary Numerical Analysis, Basic Optimization Theory and Algorithms, Introduction to Probability Theory and Statistics.
- Electrical and Computer Sciences: Introduction to Signals and Linear Systems Analysis, Control Systems, Digital Signal Processing, Basic Circuit Theory, Introduction to Digital Communications, Digital Computer Fundamentals, Introduction to Computer Programming.

TIFR Exam Paper Pattern

Mathematics:

Selection process for admission in 2021 to the various programs in Mathematics at the TIFR centres – namely, the PhD and Integrated PhD programs at TIFR, Mumbai as well as the programs conducted by TIFR CAM, Bengaluru and ICTS, Bengaluru - will be held in **two stages**.

Stages 1: For the PhD and Integrated PhD programs at the Mumbai Centre, this test will comprise the entirety of Stage I of the evaluation process.

The nation-wide will be an objective test of three hours duration, with **20 multiple choice questions** and **20 true/false questions**.

Stage 2: The second stage of the selection process varies according to the program and the centre.

School of Technology and Computer Science:

The question paper will have three parts

- Part A is common to both the streams. It will test the general mathematical aptitude of the candidate. There is no prescribed syllabus for Part A
- Part B will be oriented towards the topics listed under 'Computer Science'.
- Part C will be oriented towards topics listed under 'Systems Science'.

Note:

1. Candidates need to Attempt only one of Parts B, C.
2. The test will be of multiple-choice type, with negative marking for incorrect answers.
3. The use of calculators will not be allowed during the test.

Note:

- Paper pattern is not described by the officials for Physics, Biology and Chemistry subject.
- There is no syllabus for Biology subject is provided by the officials.