A. Mathematics :

Duration : 1 1/2 hours

Elementary Graph Theory, Set Theory, Probability and Statistics, Combinatorics, Matrices, Complex Variables, Differential Equations, Numerical Methods, Basic number theory.

B. Computer Science :

Duration : 1 1/2 hours

Fundamental Programming Concepts, Control Flow, Functions, Recursion, Basic Data Structures (arrays, lists, stacks, and queues), Basic algorithms (sorting and searching), Boolean Algebra, Digital Building Blocks (AND/OR/NAND/XOR Gates), Karnaugh's Maps, Computer Organisation, Number Systems. Capability to write programs in C or C++ is expected.

C. Electronics and Communications Engineering :

Duration : 1 1/2 hours

Selection for interview for the streams

- VLSI & Embedded Systems and
- Communication Systems and Signal Processing will be based on the score in this paper and the score in the general aptitude test.

This examination paper is divided into two parts : Part A (Electronics) and Part B (Signal Processing and Communication). The individual score in PART A will have more weightage for selection into the stream `VLSI & Embedded Systems'. Similarly, the individual score in PART B will have more weightage for selection into the stream `Communication Systems and Signal Processing'.)

Part A : Electronics

- Network Theory, Analog Devices (Diodes, BJTs), OPAMPs and Basic Analog Circuits. Boolean Algebra, Digital Building Blocks (Gates, Flip-Flops) Digital Circit Design. Signals, Systems, Filters, Transformations, Modulation, VLSI fundamentals.

Part B : Signal Processing and Communications

- Fundamentals of probability and random processes : random variables, discrete and continuous random variables, cumulative distribution function, probability mass funtion and probability density function, conditional probability, Bay's theorem, independent and uncorrelated random variables, random processes, discrete time and continuous time random processes, auto-correlation and cross-correlation functions, power spectrum.

- Fundamentals of Linear Algebra : vectors, matrices, determinants, basis, Eigen vector and Eigen value, canonical forms, characteristic and minimal polynomial.
- Fundamentals of information theory : measure of information, mutual information, entropy, capacity, lossless source coding schemes like Huffman code, run-length code etc., delta modulation.
- Signal Processing : Fourier series, Fourier transform, discrete time Fourier series and fourier transform, discrete Fourier transform, FFT, z-transform, Properties of the above transforms, LTI systems, stability of LTI systems, IIR and FIR filters.
- Communication networks : Layering hierarchies; circuit versus packet switching; virtual circuits; network mechanisms: multiplexing (TDM, Go back N), flow control, congestion control; ATM, TCP/IP.

D. Structural Engineering :

Duration: 1 1/2 hours

Bending moments and shear forces in beams, stress and strain relations, principal stresses, Mohr's circle, simple bending theory, flexural and shear stresses, torsion, analysis of trusses and frames, analysis of indeterminate structures by force/displacement methods, matrix methods of structural analysis, working and limit state design concepts, design of compression members, beam, slab, footing, staircases, basic concepts of prestressed concrete, riveted and welded joints, steel beam column connections, plate girders and design of base plate.

In addition to this, some questions from engineering mathematics like determinants, matrices, limit, continuity and differentiability, mean value theorems, integral calculus, partial derivatives, maxima and minima, ordinary differential equations and applications, initial and boundary value problems, Laplace and Fourier transforms, test for convergence, sequences and series.

E. Agriculture :

Duration : 1 1/2 hours

The subject test consists of both objective and descriptive questions in general agriculture/horticulture.

F. PGEE for CCNSB Subject Paper
Computational Natural Sciences and Bioinformatics:
Selection for interview for the streams

1. Bioinformatics and
2. Computational Natural Sciences will be based on the score in this paper and the score in the general aptitude test.

This IIIT PGG Examination Paper comprises of three sections :

Physics, Chemistry, Biology & Bioinformatics, and students, depending on their background are expected to attempt any one Section as a major and another section as a minor part. The questions will be multiple-choice.

Syllabus :

Physics Section : Mechanics and General Properties of Matter, Electricity and Magnetism, Kinetic theory and Thermodynamics, Modern Physics, Solid State Physics, Devices and Electronics.

Chemistry Section : Physical Chemistry: Atomic Structure, Theory of Gases, Chemical Thermodynamics, Chemical and Phase Equilibria, Electrochemistry, Chemical Kinetics.

Organic Chemistry : Basic Concepts in Organic Chemistry and Stereochemistry,Aromaticity and Huckel's rule,Heterocyclic Chemistry, Qualitative Organic Analysis.

Inorganic Chemistry : Periodic Table, Chemical Bonding and Shapes of Compounds, Main Group Elements (s and p blocks), Transition Metals (d block), Analytical Chemistry.

Biology & Bioinformatics Section :

Biology: General Biology, Biochemistry and Physiology, Molecular Biology, Cell Biology.

Bioinformatics : Sequence Analysis, Sequence Alignments, Phylogeny, Gene Prediction, Structural Biology.

Computational Linguistics : (Computational Linguistics exam will be conducted in late June at IIIT Hyderabad. This test is required to be taken by students of linguistics, languages background. They do not have to take the entrance test on aptitude and programming etc.)

Morphology – Words and how they are formed. What is morphology ? Basic building blocks in morphology – morphemes

Word formation – function based. Other word formation processes – affixation, suffixation, etc. Morphotactics – constraints on affixation, Morpho-phonology, Computational morphology – FSA, paradigms, etc

Word-Classes and part of speech tagging

Lexicography, Syntax, Syntactic structure, Dependency structure, Grammar formalisms

Semantics, Lexical semantics, Sentential semantics

Students should be able to analyse natural language texts in terms of morphology and basic grammatical structures.