INTERVIEW SYLLABUS

The interview syllabus is structured in two parts: Part A – Mathematics (common to all candidates) and Part B – one Engineering Discipline block of the candidate's choice.

Part A – Mathematics (Common to All Candidates)

Linear Algebra

- Matrices, rank, eigenvalues and eigenvectors
- System of linear equations; vector spaces

Calculus

- Limits, continuity, differentiation, integration
- Partial derivatives; maxima and minima; Taylor series

Differential Equations

- First and second order ODEs with constant coefficients
- Laplace transforms and applications

Probability and Statistics

- Random variables; mean, variance; Binomial, Poisson, Gaussian distributions
- Conditional probability; Bayes' theorem; basic hypothesis testing

Numerical Methods

- Root finding (bisection, Newton-Raphson); numerical integration
- Numerical solution of ODEs (Euler's method)

Part B – Engineering Discipline Blocks (Choose One)

Candidates must choose one block from the following. The choice should reflect their academic background.

B1. Mechanical Engineering and equivalent areas

- Engineering Mechanics: equilibrium, kinematics, dynamics of particles and rigid bodies
- Strength of Materials: stress, strain, bending, torsion, deflection
- Thermodynamics: laws, thermodynamic cycles
- Fluid Mechanics: Bernoulli's equation, pipe flow, pumps and turbines
- Theory of Machines: mechanisms, velocity/acceleration analysis, vibrations
- Manufacturing Processes: casting, forming, machining operations; metrology basics; CNC and automation concepts

B2. Civil Engineering and equivalent areas

- Structural Analysis: trusses, beams, frames; bending moment and shear force
- Solid Mechanics: stress-strain, Mohr's circle, column buckling
- Geotechnical Engineering: soil classification, permeability, shear strength, bearing capacity
- Fluid Mechanics and Hydraulics: open channel flow, pipe friction losses
- Environmental Engineering: water and wastewater treatment basics

B3. Computer Science and equivalent areas

- Programming: C or Python and Data Structures: arrays, linked lists, trees, graphs; sorting and searching
- Algorithms: divide and conquer, greedy, dynamic programming;
- Operating Systems: scheduling, synchronisation, memory management
- Computer Networks: OSI/TCP-IP model, IP addressing, routing, TCP/UDP
- Databases: relational model, SQL, normalisation, transactions
- Formal Languages and Automata Theory (FLAT)

B4. Electrical and Electronics Engineering and equivalent areas

- Electric Circuits: KVL/KCL, network theorems, transient analysis
- Signals and Systems: LTI systems, convolution, Fourier/Laplace/Z-transforms
- Control Systems: transfer functions, time response, stability, PID controllers
- Electrical Machines: DC machines, transformers, induction motor basics

B5. Chemical Engineering and equivalent areas

- Fluid Mechanics: continuity, Bernoulli, pipe flow, pumps
- Heat Transfer: conduction, convection, radiation; heat exchanger design (LMTD)
- Mass Transfer: Fick's law; distillation, absorption, and extraction basics
- Chemical Reaction Engineering: rate laws, ideal reactors (batch, CSTR, PFR)
- Thermodynamics and Process Control: phase equilibria; PID control basics

General Notes

- Part A (Mathematics) is mandatory for all candidates.
- Candidates must declare their chosen Part B block at the time of interview.
- Questions test conceptual understanding and basic problem-solving.
- The panel may additionally ask about the candidate's academic projects, research interests, and motivation for the programme.