

Aerodynamics and Flight mechanics panel

Written test syllabus (Mathematics)

Linear Algebra: Vector algebra; Matrix – Matrix operations, Determinant, Rank of a matrix, Eigen values and Eigen vectors; System of linear equations.

Calculus: Functions of a single variable and plots; Limit, continuity and differentiability; Mean value theorem; Local / Global maxima and minima; Sequences and Series; Taylor and Maclaurin series; Indefinite and definite integrals; Application of definite integral to find area and volume; Partial and total derivatives. Functions of complex variables – Roots, Analytic functions (Cauchy-Riemann equation).

Differential Equations: First order linear and nonlinear ordinary differential equations (ODE); Higher order linear ODEs with constant coefficients; Cauchy-Euler equation.

(It is presumed that the candidate is knowledgeable with high-school mathematics such as basic geometry, trigonometry, coordinate geometry and algebra, which are fundamental to the given syllabus for the mathematics test)

Interview Syllabus (Prepare for a few topics from below)

Basics of Fluid Mechanics: Basic equations of motion, Classification of Flows, Flow past bodies, Vortex motion, Lift, Drag, moments.

Basic Numerical Methods: Convergence, Stability, Finite difference Methods, Complex analysis, Differential Equations, Special functions, Programming Skills.

Basic Gas dynamics: Wave Propagation, Mach Waves, Compressible Flows, Nozzle flows, Shocks, Expansion, Fanno flows, Rayleigh flows.

Experimental Techniques: Measurement of Flow parameters - pressure, temperature, velocity, mass flow, flow visualization.

Flight Dynamics & Control. Laplace transform, response of LTI, transfer functions, feedback systems, open loop and closed loop gains, types of systems, poles and zeros, state space form, stability, controllability, observability.

Free body diagram, point mass model, Airplane performance, rigid body dynamics, trim and stability, static margin, longitudinal and lateral-directional dynamics, longitudinal and lateral modes.