

Key Words for the Problems of Subjects of the Entrance Examination for the
Division of Mechanical Engineering at Tohoku University
(August, 2024)

【Mathematics A】 Differential and Integral Calculus, Linear Algebra, Vector Analysis

【Mathematics B】 Ordinary Differential Equations, Partial Differential Equations,
Fourier Series and Fourier Transforms, Laplace Transforms

【Specialized Subjects】

Thermodynamics : Basic Laws of Thermodynamics, Processes of Ideal Gases, Conversion Cycles between Heat and Work, Phase Transitions, General Relations among Quantities of State, Available Energy (Exergy)

Fluid Dynamics : Ideal Fluid Flow, Vortex Dynamics, Reynolds Similarity Law, Momentum Theorem, Pipe Flow, Boundary Layer

Strength of Materials : Simple Stress, Combined Stresses, Torsion of Shafts, Shearing Force and Bending Moment in Beams, Stresses in Beams, Deflection of Beams, Statically Indeterminate Beams, Strain Energy and Energy Methods, Buckling of Bars, Thermal Stress

Dynamics of Mechanical Systems : Systems with One Degree of Freedom, Systems with Two Degrees of Freedom, Systems with Multiple Degrees of Freedom

Control Engineering : Laplace Transform, Transfer Function, Time Response, Frequency Response, Stability, PID Control, Pole Placement, State Equation, Transfer Matrix, Controllability, Observability, Realization, Design, Optimal Regulator, Observer