

Entrance Examination for 2023 Master's Program
Specialized Engineering Knowledge
(Question Abstract)

[Structural Mechanics]

Given the equation for the deflection curve of a simply supported beam, the first question asks to determine the external force acting on the simply supported beam and to draw a shear force diagram and a bending moment diagram. The second question deals with determining the reaction forces and drawing shear force and bending moment diagrams for a simply supported beam subjected to uniformly distributed loads when a support positioned downwards from the center point of the span is added. When a vertical rigid member is rigidly connected on a support of the simply supported beam and a horizontal force is applied to the vertical rigid member, the second question also includes determining the minimum horizontal force that reduces the reaction force on the support located below the center point of the span to zero.

[Hydraulics]

Question 1 relates to the fundamentals of potential flows and the boundary conditions of flows driven by surface waves. Question 2 includes the equations of motion for incompressible fluids, expressions for viscous stress, Reynolds decomposition and closure of the Reynolds equation.

[Soil Mechanics]

Question 1 is about understanding of soil and ground conditions, which covers various basic indices of the ground and seepage pressure caused by lifted groundwater table. Question 2 determines whether liquefaction will occur during an earthquake in the ground composed of sand and silt layers and calculates the vertical stress increase in the ground due to the construction of an embankment.

[System Analysis for Planning and Management]

The first question relates to cost benefit analysis. It is required the basic knowledge about cost benefit analysis including the relationships between the timing of costs and net present value, in addition to the general equation to obtain the net present value.

The second question relates to a non-linear programming problem with inequality constraint. It is required to find an optimal solution by deriving Karush-Kuhn-Tucker conditions. In addition, it is required to examine the optimal solution when the feasible region changes from the original