Entrance Examination for 2017 Master's Course Program
Specialized Engineering Knowledge
(Question Abstract)

[Structural Mechanics]
Q1. Calculate the slope and the strain in the top fiber of a simple beam subjected to a moment force.
Q2. Calculate the reaction force and the displacement of a frame structure subjected to a concentrated force and draw the bending moment diagram of the structure.
Q3. The frame structure given in Q2 is stiffened with a truss member. Draw the axial force diagram and the bending moment diagram due to a redundant force in the truss member and calculate the redundant force. Find the displacement when the axial stiffness is assumed to be infinite.

[Hydraulics]
Q1. Questions on steady pipe flows are given. The outline is as follows:
1) Frictional energy loss associating with Darcy-Weisbach equation,
2) Form-loss due to sudden expansion of a pipe relating to Borda-Carnot equation,
3) Forces acting on bended pipe concerning to momentum equations.
Q2. Fundamental questions on specific energy and depth variations in steady open-channel flow and advanced problems on width-varying open-channel flow.

[Soil Mechanics]
Regarding consolidation of a saturated clay layer, obtain the excessive pore water pressure distributions and isochrones in a clay layer as well as the final consolidation settlement due to groundwater drawdown. In addition, draw the Mohr's stress circle, stress paths, and etc. obtained from the results of uniaxial compression test and triaxial compression test on a clay sample, along with determinations of the related shear strength parameters and descriptions of the deformation and shear strength characteristics.

[System Analysis for Planning and Management]

Q1. Solve a Linear Programming problem with two variables and complete the final Simplex tableau. Find out a range of coefficient of objective function which does not change the optimal solution obtained above. Formulate the corresponding dual problem and complete the final tableau of dual Simplex method.

Q2. Total cost of management of a road over two periods is minimized by Dynamic Programming. Introducing the sum of the minimized costs that depend on a deterioration state in each period by applying the backward induction, decision is made on whether the renewal is implemented or not. Moreover, the optimal behavior and the minimized costs are derived in the case where a life-extension structure is invested at the initial point of time. Finally, an area of combinations of parameters where the life-extension investment is favorable is illustrated.