459.732 Numerical Methods in Rock Engineering

Autumn 2014

Final Exam (09:00 - 12:00)

8 Dec 2014

* Answers to the questions can be Korean or English.

1. Consider the following boundary value problem

$$u''(x) = 1 \qquad 0 < x < 1$$
$$u(0) = 0, \ u'(1) = -1$$

Obtain the approximate solution of u and u' using the finite element method. In applying FEM, use linear polynomial trial solution for simplicity.

1) Formulate the finite element approximation by starting with the Galerkin residual equations (20).

2) Obtain the solution using both one and two elements (20).

3) Compare the obtained solutions with the analytical solution (10).

4) Suggest at least two physical systems that can be simulated using the above equation and explain the parameters and boundary conditions associated with those systems (10).

2. Explain the governing equations and solutions techniques of explicit discrete element method for application in blocky and particulate systems (20).

3. Discuss the difference between explicit discrete element method and implicit discrete Element method such as DDA and Numerical manifold method (20).