Department of
Civil and Environmental Engineering

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CIE-365 Spring 2022: Homework assignment 5

Due date: 04/04/2022 at 10:00 AM
Possible points: 35

Answer the following questions based on the contents of Module 5 parts 1 and 2.

1. [O3] (15 points) Given the void ratio versus pressure data shown below. The initial void ratio is 0.725, and the existing vertical effective overburden pressure is 130 kPa. Determine:

   (a) The overconsolidation ratio.

   (b) The compression and recompression index.

   (c) If this consolidation test is representative of a 12 m thick clay layer, compute the settlement of this layer if an additional stress of 220 kPa was added.

Table 1: Data for problem 1

Void ratio	Pressure (kPa)
0.708	25
0.691	50
0.67	100
0.632	200
0.635	100
0.65	25
0.642	50
0.623	200
0.574	400
0.51	800
0.445	1600
0.46	400
0.492	100
0.53	25

2. [O3] (15 points) A deposit of Swedish clay is 12 m thick, on the average, and apparently drained at the bottom. The coefficient of consolidation for the clay was estimated to be 1×10^{-4} cm^2/s from laboratory tests. A settlement analysis based on oedometer tests predicted ultimate consolidation settlement under the applied load in the field to be 1.2 m. Determine:

   (a) How long would it take for settlements of 40 and 70 cm to occur?

   (b) How much settlement would you expect to occur in 5 yr? 10 yr? 50 yr?

   (c) How long will it take for the ultimate settlement of 1.2 m to occur?.

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3. [O3] (5 points) A layer of normally consolidated clay 3.5 m thick has an average void ratio of 1.3. Its compression index is 0.6 and its coefficient of consolidation is 1 m^2/yr. When the existing vertical pressure on the clay layer is doubled, what change in thickness of the clay layer will result?, How long will this settlement take?

Note: [O#] indicates the course objective that is partially covered by this assignment.