King Saud University
College of Engineering
Department of Civil Engineering

CE 480 Soil Mechanics
Assignment # 4

Problem # 1

The coefficient of consolidation of the clay layer in problem # 2 in Assignment # 3 is 7.5 mm^2/min. Find the following:

a) The time required for the clay layer to settle 0.10 m when:

i. The clay layer is doubly drained

ii. The clay layer is singly drained

b) The settlement when U_{avg} is 80%

c) The excess pore water pressure at depth 2 m from the top of the clay layer for t = 6 years.

Problem # 2

A building is to be placed on top of a 10 m thick clay layer that sits on bedrock. The structure will increase the average effective stress from 80 kPa to 150 kPa. The following data were obtained from a corrected consolidation test on an undisturbed clay sample:

σ_1'= 80 kPa	e_1= 0.895
σ_2' = 200 kPa	e_2= 0.780

The average value of the coefficient of permeability of the clay layer is 3.5 x 10^{-9} cm/s. Compute and plot the decrease in thickness with time for a 10 m layer of this clay that is drained at the upper surface only.

Problem # 3

In an oedometer test, a specimen of saturated clay 19 mm thick reaches 30% consolidation in 10 min. How long would it take a layer of this clay 8 m thick to reach the same degree of consolidation under the same stress and drainage conditions?
How long would it take the layer to reach 70% consolidation?

Problem #4

The time rate of settlement data shown below is for stress increment 540-1080 kPa from an oedometer test. The initial sample height is 19.0 mm, and there are porous stones on the top and at the bottom of the sample.

Time Elapsed (min)	Dial Reading (mm)
0	2.593
0.1	2.433
0.25	2.407
0.5	2.380
1	2.343
2	2.295
4	2.238
8	2.183
15	2.150
30	2.120
60	2.101
120	2.086
240	2.071
504	2.055
1422	2.033

Determine the coefficient of consolidation c_v by:

a) The log time-fitting procedure,

b) The square root of time procedure,

c) Compare the results of (a) and (b).