Due 28/03, Friday, 17:00
To be dropped into the homework box inside the laboratory.

Soil Mechanics Homework-2

State all assumptions clearly. For all questions, you may take $\gamma_w = 10\ kN/m^3$.

1. A layer of sand extends from ground level to a depth of 7 m and overlies a layer of clay. The ground water table is 3 m below the ground surface. The saturated unit weight of the sand is 19 kN/m^3 and that of the clay is 20 kN/m^3. The dry unit weight of the sand is 16 kN/m^3. The capillary zone is 1 m thick.

a) Plot the variation of total vertical stress, pore pressure and vertical effective stress, with depth, down to the depth of 10m.

b) Foundation of a building will be placed at the depth of 5 m. For this purpose the groundwater at the site is lowered to the depth of 6m, and the top 5 meters of the soil is excavated, all in a short time. Plot the variation of total vertical stress, pore pressure and vertical effective stress with depth, when the excavation is finished.

c) When completed, the building applies a foundation pressure of 120 kPa. At the end of construction, the dewatering system is also stopped, eventually bringing the groundwater back to its original level. Plot the variation of total vertical stress, pore pressure and vertical effective stress with depth, a long time after the completion of the project.

2. A clay layer of 14 m thickness with a saturated unit weight of 20 kN/m^3 overlies a sandstone formation. The ground water table is at the ground surface. Piezometric mesaurements show that there is artesian pressure in the sandstone amounting to a water level of 2 m above the ground surface at the site.

a) Plot the variation of total vertical stress, pore pressure and vertical effective stress, with depth, down to the depth of 14m.

b) The site will be excavated for a landfill, and any waterflow into the excavation will be pumped out, keeping the groundwater level at the base of the excavation. What is the maximum depth to which we can excavate without having instability at the bottom of excavation.