HOMEWORK 2

*Homework 2 is due on May 5, 2015, Tuesday at **16:59.***

CE366 Homeworks are to be submitted to the "CE366 Homework box" in Soil Mechanics Lab. Soil Mechanics lab door is locked every day at 17:00 and homeworks cannot be submitted under the door.

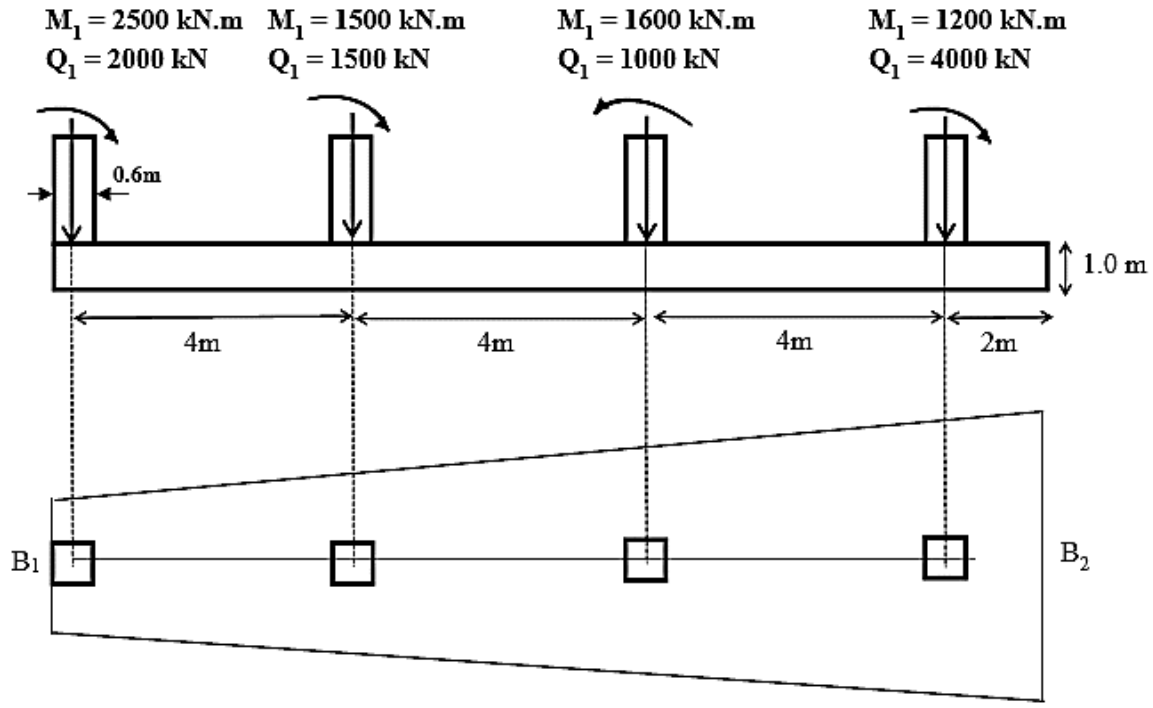
Homework solutions will be posted to the course website on May 5, 2015, Tuesday at 17:00.

Unless otherwise stated, use γ_{water}= 10 kN/m^3

If necessary, you can make any reasonable assumptions. While doing so, you should state your reasoning.

Question 1 (25%)

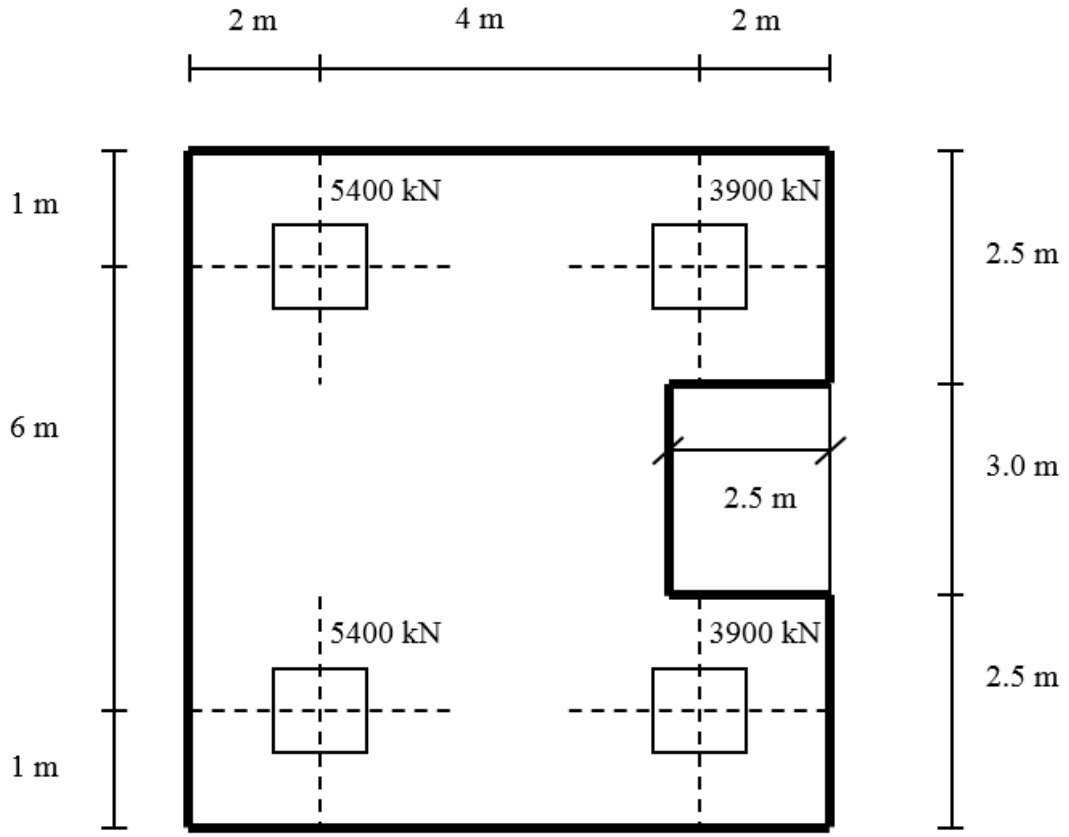
Determine the dimensions B1 and B2 of a rigid trapezoidal combined footing to achieve a uniform soil pressure of 200 kN/m^2.
($\gamma_{conc.}$ = 24 kN/m^3)
Note: Assume that the footing rests on top of the ground surface.



Question 2 (25%)

Calculate the base pressures at the corners of the mat foundation shown below. 4 square columns apply 5400, 5400, 3900 and 3900 kN's load. Do not consider weight of the mat.

Note: Assume that the mat foundations rests on top of the ground surface.



Question 3 (25%)

Do a "selfie (özçekim)" with a retaining wall!

Please take a look at your close vicinity to see different types of retaining walls in Ankara. For this question, we would like you to take a photo of yourself with a retaining wall. (Please note that group pictures are not allowed in this question. Photos from your summer practice are not allowed, either.)

i) (10%) Put at most 4 photos showing the general overview of the wall.

ii) (3%) Try to identify the type of retaining wall and report the approximate location.

iii) (12%) Prepare a sketch (hand drawing) showing the approximate dimensions and construction details of the wall to the best of your knowledge.
(A sample answer is given below for you.)

Sample Answer:

(i)

Pic 1: Selfie with the wall

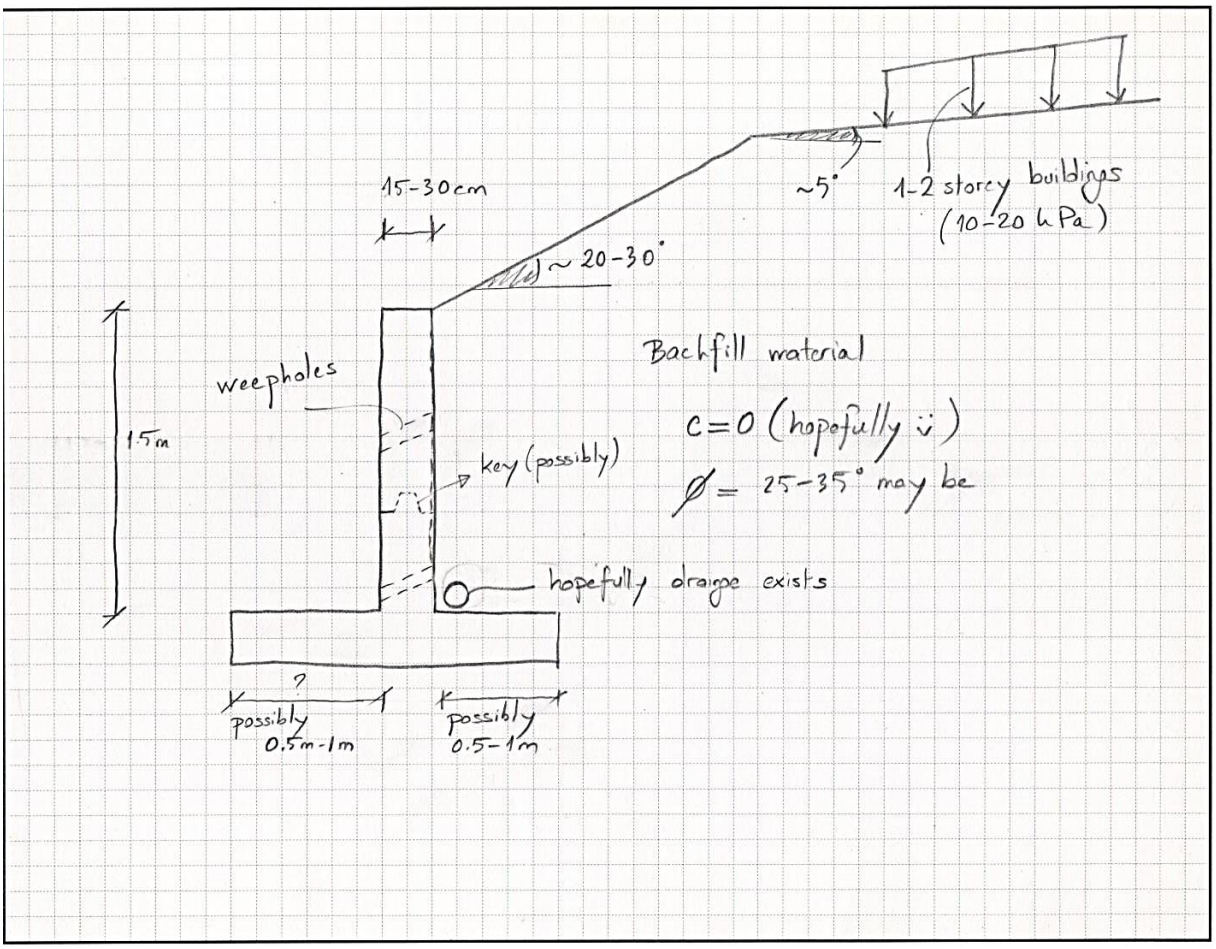
Pic 2: Weepholes along the height of the wall

Pic 3: Cracks along the height of wall

Pic 4: Cracks along the height of wall

ii) I guess the wall is cantilever wall. It is located in METU Campus, Teknokent area where METU faculty members reside.

iii)



Question 4 (10%)

Watch the video at the link below, and answer the questions.

https://www.youtube.com/watch?v=fYjIdsJXE5k

a) What is the angle of the failure plane at the back of the retaining wall? Capture an image and measure this angle. This angle must be related to the friction angle of the sand. What is the friction angle of this sand?
b) At the time of failure, assume the factor of safety against overturning as equal to 1.00 and find the surcharge, q (kPa), applied by the building at the top. You need to draw the problem to scale. The height of the wall is 50 cm. The unit weight of the clean sand and the wall material can be assumed as 19 and 27 kN/m^3, respectively. Use Rankine earth pressure theory.

Question 5 (15%)

In order to satisfy $F.S_{sliding} \geq 1.5$ and $F.S_{overturning} \geq 2.0$, what should be the minimum width of the gravity retaining wall shown below in terms of wall height, H. Wall is made of a material with unit weight 24 kN/m^3. Note that, for economical and green/sustainable construction purposes, a local soil with c=5 kPa and ϕ=35° will be used as backfill material (instead of bringing many truckloads of clean gravel from far away). Backfill material is freely draining and all proper drainage measures are taken. $c_{wall\text{-}soil} = 2/3 * c_{soil}$ and $\tan\delta = 2/3 * \tan\phi$.

Note: Solve by using Rankine earth pressure theory.