Mid-West University

Examinations Management Office

End Semester Examinations 2081

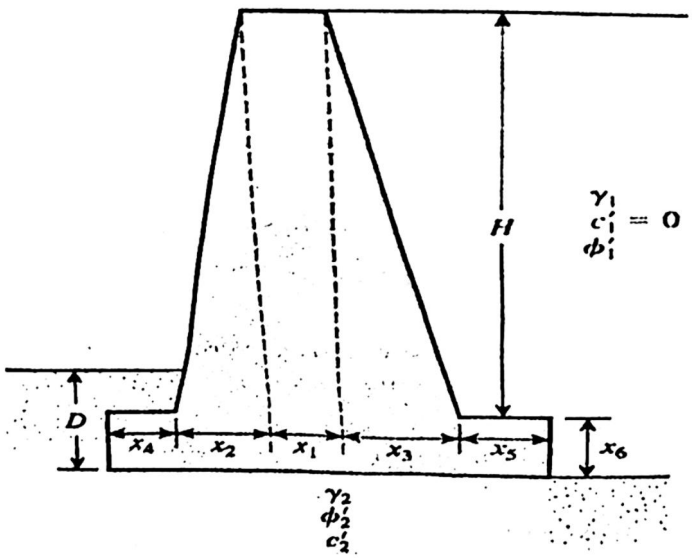
Master level/ M. Sc. (Structural Engineering)/ 1st Semester — Full Marks: 60

Time: 3 hours — Pass Marks: 30

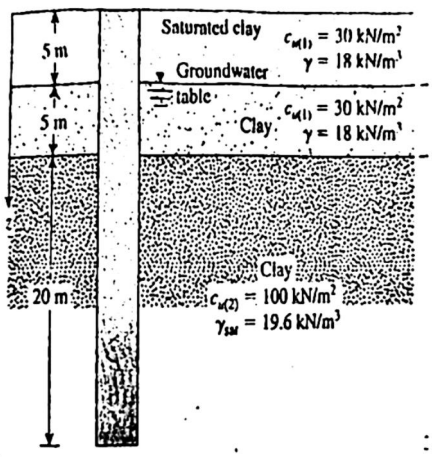
Subject: Advanced Geotechnical Engineering (STR515)

- *Attempt all the questions.*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. Recent advancements in ground improvement techniques include the use of geomaterials such as geosynthetics and advanced chemical grouting methods. Evaluate the impact of these techniques on the performance and cost-effectiveness of foundation systems in comparison to traditional methods such as preloading and vibro-compaction. Provide examples of projects where these advanced techniques have been successfully implemented. **[10]**
2. A geotechnical firm where you are associated is requested to carry out soil investigation work for hospital building having plot area 3500 sqm at Birendranagar, Surkhet. For the purpose, a detailed soil survey has to be conducted. As a geotechnical engineer, what are the steps to be carried out during subsurface exploration? Plan the number and depth of boreholes to be drilled for soil investigation. What kind of tests you are going to perform with the recommended soil samples in the laboratory for the design of building? Prepare the standard format of geotechnical report to be submitted to the client. **[10]**
3. Illustrate about the suitability of different methods for finding out bearing capacity of soil. A rectangular footing of size 3m*6m is founded at a depth of 1m in a homogenous C-ø soil. The water table is at a greater depth. The unit weight of soil is 18KN/m3.Determine the net safe load. C=100Kpa and ø =20. The load is vertical and acting at a distance of 0.3m from the centre along the centre line of the foundation in the width direction(e_B=0.3m). Use Meyerhoff equation and assume general shear failure and a factor of safety 3. **[10]**
4. Nepal is witnessing many bridge failure problems. What can be the reason behind this. Provide reliable solution to the problem. A geotechnical engineer made a preliminary settlement analysis for a foundation of an office building that is to be constructed at a location where the strata contain compressible soil layer. He calculated 50mm of primary consolidation settlement. The building will impose an average vertical stress of 150Kpa in the clay layer. As often happens in the design practice .design changes are required. In this case actual thickness of clay layer is 30% more than the original soil profile indicated and during construction the GWT has to be lowered by 2m. Estimate the new primary consolidation settlement. **[10]**
5. For the given gravity wall calculate the factor of safety with respect to overturning, sliding and bearing Capacity. Wall dimensions: H =6m, x_1=0.6m, x_2=2m, x_3=2m, x_4=0.5m, x_5=0.75m, x_6=0.8m, D=1.5m, Soil properties: Υ_1=16.5KN/m3, $ø_1$=32, Υ_2=18, $ø_2$=22, C_2=40KN/m^2
   Take Coefficient of active earth pressure K_a=0.4023 and bearing capacity of underlying soil 500Kpa. Use Rankine active earth pressure. **[10]**



6. What factors should be considered while designing pile foundation in areas prone to liquefaction. Give your views regarding this. Calculate the skin resistance Qs by α, λ, β method. For method use $\phi=30^0$ for all clay layers. The first 10 m of soil is normally consolidated. The bottom clay layer has an OCR=2. Take, α= 0.82 for the first and second layers and 0.48 for third layer, λ= 0.136 and diameter of pile=406mm.Also estimate the allowable pile capacity taking FS=4. **[10]**



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