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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2021

B.Tech. IV Semester

COURSE CODE: 10B11CE411 MAX. MARKS: 35

COURSE NAME: GEOTECHNICAL ENGINEERING

COURSE CREDITS: 4 MAX. TIME: 2 HRS

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume necessary data wherever required.*

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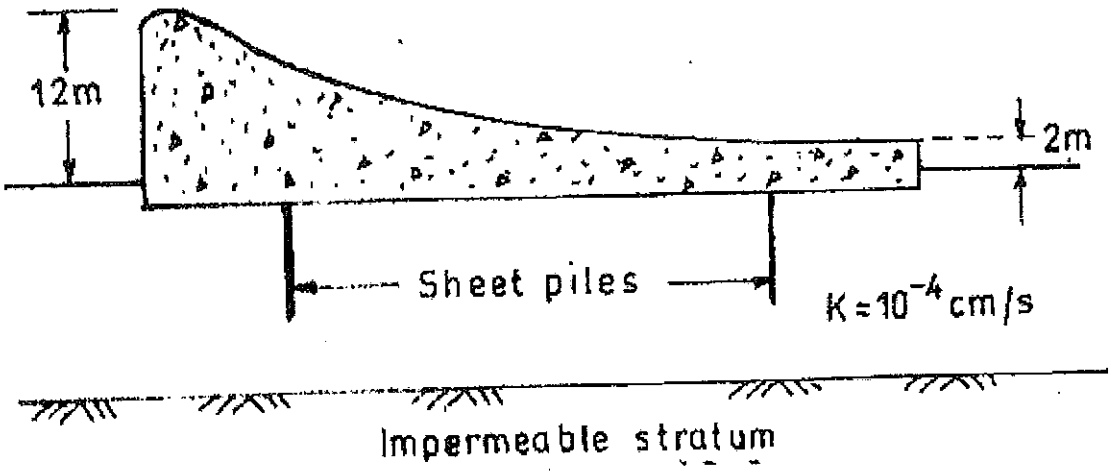
[1] Derive Terzaghi's one – dimensional consolidation, stating all the assumptions and their significance. Also describe the three dimensionless parametric solution for Terzaghi's consolidation equation and its significance in consolidation determination. [5]

[2] The void ratio and specific gravity of a sample of clay are 0.73 and 2.7 respectively. If the voids are 92% saturated, find the bulk density, the dry density, and the water content. What would be the water content for complete saturation, the void ratio remaining the same? [3]

[3] Given the flow situation shown in the figure.



a) Is this a case of confined or unconfined flow?

b) What are the boundary conditions for the flow situation depicted in the figure?

c) A flownet drawn for this condition gives $n_f = 3$; $n_d = 30$. What is the quantity of flow per metre run occurring under the weir?

d) The elementary square at the toe of the weir has dimensions of 0.6 m. What is the exit gradient?

e) For what reservoir height would the exit gradient be equal to 1? What is the implication of condition to the safety of the weir? **[1+1+1+1+2 = 6]**

[4] The shear strength parameters of a given soil are c = 0.26 kg/cm^2 and ϕ = 21°. Undrained triaxial tests are to be carried out on specimens of this soil. Determine:

a) Deviator stress at which failure will occur if the cell pressure be 2.5 kg/cm^2.

b) The cell pressure during the test, if the sample fails when the deviator stress reaches 1.68 kg/cm^2. **[3+2 = 5]**

[5] A layer of clay 2 m thick is subjected to a loading of 0.5 kg/cm^2. One year after loading, the average consolidation is 50%. The layer has double drainage,

a) What is the coefficient of consolidation?

b) If the coefficient of permeability is 3 mm/year, what is the settlement after one year?

c) How much time will the layer take to reach 90% consolidation? **[2+2+2 = 6]**

[6] Write a short note on unconfined compressive strength test. With the help of Mohr – circle deduce the relationship between undrained shear strength and unconfined compressive strength of clay. **[2+2 = 4]**

[7] With the help of compaction curves, explain how compaction on clay is different from compaction in sand? **[3]**

[8] The following data were recorded in a constant head permeability test.

Internal diameter of permeameter = 7.5 cm
Head lost over a sample length of 18 cm = 24.7 cm
Quantity of water collected in 60 seconds = 626 ml
Porosity of the soil sample = 44%

Calculate the coefficient of permeability of soil, discharge velocity and seepage velocity during the test. **[3]**