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Total Number of Pages: 02

M.TECH
P2GEBC01

2nd SEMESTER EXMINATION 2016-17
ADVANCED GEO-MECHANICS
BRANCH(S): GEOTECHNICAL ENGG
Time: 3 Hours
Max Marks:100
Q.CODE:Z344

Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.
Assume Suitable Data Wherever Necessary

- Q1** Answer the following questions: **(2 x 10)**
- A clay soil sample is tested in a triaxial apparatus in consolidated drained conditions at a cell pressure of 100 KN/m^2 . What will be the pore water pressure at a deviator stress of 40 KN/m^2 ?
 - What is critical void ratio?
 - What is the angle by which the failure plane will be inclined to major principal plane, for a sample of dry, cohesionless soil with friction angle, ϕ ?
 - A river 6 m deep consists of a sand bed with saturated unit weight of 20 KN/m^3 . $\gamma_w = 9.81 \text{ KN/m}^3$. What is the effective vertical stress at 6 m from the top of the sand bed?
 - What are principal planes?
 - What is void ratio and porosity? Which is more frequently used and why?
 - What is soil suction? What is capillarity in soils?
 - What is a Mohr circle? What is its significance in geomechanics?
 - What do you mean by Unconsolidated Undrained (UU), Consolidated undrained (CU), Consolidated drained (CD) soils?
 - What is the principle of triaxial test?
- Q2** An embankment, having a total volume of 5000 m^3 has a water content of 16% and the dry density of 1.75 g/cc . If it was constructed from a borrow pit where the undisturbed soil has a water content of 13% and voids ratio of 0.6, calculate the quantity of soil which was excavated for the construction of the above embankment. Take the specific gravity of soil solids as 2.68. **(20)**
- Q3** (a) Explain the shearing characteristics of sand. **(10)**
(b) Explain Mohr failure criterion **(10)**
- Q4** a) A cohesive soil has an angle of shearing of 15° and a cohesion of 35 KN/m^2 . If the specimen of this soil is subjected to a triaxial **(10)**

- compression test, find the value of the lateral pressure in the cell for failure to occur at total stress of 300KN/m^2 .
- b) In a drained triaxial compression test conducted on dry sand, failure occurred when the deviator stress was 218 KN/m^2 at a confining pressure of 61 KN/m^2 . What is the effective angle of shearing resistance and the inclination of failure plane to major principal plane? (10)
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- Q5** a) The water table in a deposit of sand 8m thick is at a depth of 3m below the surface. Above the water table, the sand is saturated with capillary water. The bulk density of sand is 19.62 KN/m^3 . Calculate the effective pressure at 1m, 3m and 8m below the surface. (10)
- b) What is the Shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 295 KPa and the pore water pressure 120KPa ? The effective shear strength parameter are $C = 12\text{kPa}$ and $\phi = 30^\circ$. (10)
- Q6** a) A saturated clay is known to have effective strength parameters of $C^l = 10\text{ kPa}$ and $\phi = 28^\circ$. A sample of this clay was brought to failure quickly so that no dissipation of the pore water pressure could occur. At failure it was known that $\sigma'_1 = 60\text{kPa}$, $\sigma'_3 = 10\text{ kPa}$ and $U_f = 20\text{ kPa}$. (10)
- (a) Estimate the value of σ_1 and σ_3 at failure.
- (b) What was the effective normal stress on the failure plane?
- (c) What was the value of undrained shear strength C_u ?
- b) Calculate the coefficient of permeability of a soil sample, 6 cm in height and 50cm^2 in cross-sectional area, if the quantity of water equal to 430ml passed down in 10 minutes, under an effective constant head of 40 cm. (10)
- Q7** a) The total unit weight of the glacial outwash is 16KN/m^3 . The specific gravity of soil particles of the soil is 2.67. The water content of the soil is 17%. Calculate: (a) Dry unit weight (b) Porosity (c) Void ratio (d) Degree of saturation. (10)
- b) Explain the laboratory tests to determine the shear strength of soil. (10)