D 20907 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION OCTOBER 2011

Geotechnical Engineering

CE/PTCE 09 504—GEOTECHNICAL ENGINEERING—I

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

Short answer questions (One /two sentences). All questions are compulsory.

1. What do you mean by three phase system ?
2. Define water content degree of saturation porosity and void ratio.
3. Differentiate between undrained test and consolidated drained test.
4. Enumerate the causes of preconsolidation.
5. List the assumptions of Rankine's earth pressure theory.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. An undisturbed sample of soil has a volume of 100cm^3 and mass of 200 grams. On oven drying for 24 hours, the mass is reduced to 170 grams. If the specific gravity of grain is 2.68, determine the water content, void ratio and degree of saturation of the soil.
7. The water table in a certain area is at a depth of 4m below the ground surface. To a depth of 12m, soil consists of very fine sand having an average void ratio of 0.65. Above the water table the sand has an average degree of saturation of 50%. Calculate the effective pressure on a horizontal plane at a depth 10 m below the ground surface.
8. Two identical specimens of dry sand are tested in the triaxial cell apparatus with confining pressure of 150 kPa and 250 kPa respectively. If the angle of internal fiction of sand is 35°, what are the values of the additional axial stress at the failure of the specimen ?
9. Two clay layers A and B are respectively 4m and 5 m thick. The time taken for layer A to reach 50% consolidation is 6 months. Calculate the time taken by the layer B to reach the same degree of consolidation. The coefficient of consolidation of layer B is half the coefficient of consolidation for layer A. Both the layers have double drainage.
10. A cylindrical specimen of cohesive soil of 10 cm diameter and 20 cm length was prepared by compaction in a mould. If the wet weight of the specimen was 2.25 kg and its water content was 15%, determine the dry unit weight and the void ratio. If the specific gravity of the particles was 2.7, find the degree of saturation.

Turn over

11. A retaining wall has a vertical back and is 8 m high. The back face of the wall is smooth and the upper surface of the fill is horizontal. Determine the thrust on the wall per unit length. Take C = 1t/m^2, γ = 1.8t/m^3 and ϕ = 20°. Neglect tension.

(4 × 5 = 20 marks)

Part C

Module I

12. A soil sample consisting of particles of size ranging from 0.5 mm to 0.01 mm is put onto the surface of still water tank 5 m deep. Calculate the time of settlement of the cousest and the finest particles of the sample to the bottom of the tank. Assume average specific gravity of oil particle as 2.66 and viscosity of water as 0.01 poise.

Or

13. The plastic limit of a soil if 25% and its plasticity index is 8%. When the soil is dried from its state at plastic limit, the volume changes to 25% of its volume at plastic limit. Similarly the corresponding volume change from the liquid limit to the dry state is 34% of its volume at liquid limit. Determine the shrinkage limit and shrinkage ratio.

Module II

14. A stratified soil deposit consists of 4 layers of equal thickness the coefficient of permeability of the second, third and fourth layers are respectively 1/3, 1/2 and twice of the coefficient of permeability of the top layer. Compute the average permeabilities of the deposit, parallel and perpendicular to the direction of stratification in terms of the permeability of the top layer.

Or

15. A saturated specimen of cohesionless sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2 when the all pressure was 100 kN/m^2 under the drained conditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand, if it is tested under cell pressure of 200 kN/m^2.

Module III

16. Explain spring analogy for primary consolidation.

Or

17. What do you mean by field compaction control ? Explain in detail how it is achieved.

Module IV

18. Describe Culmann's graphical method for the determination of active earth pressure.

Or

19. Elaborate Swedish circle method for the analysis of slopes and compare this method with the friction circle method.

(4 × 10 = 40 marks)