γ_{sat}=19kN/m³, use Rankine's method to calculate the magnitude and line of action of the active earth force on the wall assuming the soil can provide tension. Sketch the pressure distribution on the wall.

5. Attempt any **four** parts of the following : **(5×4=20)**

(a) Write notes on any **two** of the following :

(i) Seismic Refraction method

(ii) Electrical resistivity method

(iii) Field Plate Load test

(iv) Static cone penetration test

(b) A SPT was conducted at a depth of 2m in sand deposit with a unit wt of 20kN/m³. The water table at this site was at 1 m below GL. The N value was found 5. What would be corrected N value ? If SPT was conducted at 15m below GL the N obtained was 21. What is corrected N ?

(c) A footing, 2m square is founded at a depth of 1.5m in a sand deposit, for which the corrected value of *N* is 27. The water table is at a depth of 2 m from the surface. Determine the net allowable bearing pressure, if the permissible settlement is 40 mm and a factor of safety of 3 is desired against shear failure.

(d) A vane used to test a deposit of soft alluvial clay required a torque 72 m-newton. The vane dimension were D= 100mm. H=200mm. Find a value for the undrained shear strength of clay.

(e) A square footing, 1.8m × 1.8m, is placed over loose sand of density 1.6g/cm³ and at a depth of 0.8 m the angle of shearing resistance is 30°. N_c=10.14, N_q= 18.4, and N_γ=15.1. Determine the total load that can be carried by the footing.

(f) A rectangular footing 4m × 2m exerts a pressure of 80KN/m² on a cohesive soil having Es=5.1 KN/m², μ = 0.5 Determine the immediate settlement at the centre assuming the footing is flexible.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2130 **Roll No.**

B. Tech.

(SEM. V) THEORY EXAMINATION 2011-12

GEO-TECHNICAL ENGINEERING

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) A natural soil deposit has bulk unit wt of 18.5 kN/m³ and water content of 5%. Calculate the amount of water required to be added to 5 cubic meter of soil to raise the water content to 14%. Assume the voids ratio to remain constant. Also find degree of saturation, assume G=2.65.

(b) Why the montmorillonite clay has very high water absorption ? Discuss with reasons.

(c) Discuss various field and laboratory methods of water content determination of soils.

(d) Explain the following :

(i) Activity of soil

(ii) Thixotropy of clays

(iii) Corrections in hydrometer analysis

(iv) Indian soil classification

(e) Write notes on :

(i) Residual soils

(ii) Glacial soils.

(f) Explain well graded, poorly graded, gap graded and uniformly graded soils.

2. Attempt any **four** parts of the following : **(5×4=20)**

(a) Explain following terms :

(i) Bulking of sand

(ii) Quick sand condition

(iii) Properties of flow nets

(b) A granular soil deposit has 10m depth over an impermeable layer. The ground water table is at 5m depth below ground surface. The soil is moist upto 2m from water table with degree of saturation of 50%. Plot the variation of total stress, pore water pressure and effective stress. Take e= 0.6 and Gs=2.67.

(c) Derive the equation for finding discharge through a unconfined acquifer.

(d) The following data pertains to the coefficients of permeability of a stratified soil deposits.

Soil	Coefficient of permeability (mm/sec)	Thickness of strata(m)
1	1×10^{-3}	4
2	2×10^{-4}	3
3	4×10^{-6}	6

Find the ratio of coefficients of horizontal to vertical permeability.

(e) What are various types of field compacting equipments ? Which type of rollers are suited for clayey and gravel soils ? Also give specifications of such rollers.

(f) Discuss the factors that affect the accuracy of flow quantities calculated from flow nets. If the permeability of a small soil sample, extracted from within the area of the flow net, is measured in the laboratory would you expect it to provide good predictions of the flow quantities ?

3. Attempt any **two** parts of the following : **(10×2=20)**

(a) An undisturbed sample of clay 24mm thick consolidated 50% in 20 minutes when tested in laboratory with drainage allowed at the top and bottom. The clay layer from which the sample was obtained is 4.0m thick in field. How much time will it take to consolidate 50% with double drainage ? If the clay stratum has only single drainage, calculate the time to consolidate 50%.

(b) A rectangular footing, 2m × 3m in size, has to carry a uniformly distributed load of 100kN/m^2. Plot the distribution of vertical stress intensity on a horizontal plane at a depth of 2m below the base of footing by Boussinesq's method.

(c) In the laboratory test on a clay sample of thickness 25mm drained at top only 50% consolidation occurred in 10 minutes. Find the time required for corresponding clay in field of 2m thick and drained at top and bottom to undergo 75% consolidation. Assume T_{50}=0.197 and T_{75}=0.400.

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) Two identical samples of soil were in triaxial apparatus. The first specimen failed at a deviator stress of 800 KN/m^2 when the cell pressure was 200 KN/m^2 while the second specimen failed at deviator stress of 1400 KN/m^2 when cell pressure was 300 KN/m^2. Find c and Ø for soil.

(b) A cylindrical specimen of dry sand was tested in a triaxial test. Failure occured under a cell pressure of 1.2 Kg/cm^2 and at deviator stress of 4.0 Kg/cm^2.

(i) What is the angle of shearing resistance of soil ?

(ii) What are normal and shear stresses on failure plane and angle of failure plane with minor principal plane ?

(iii) What was maximum shear stress on any plane in the specimen at time of failure and how the plane in question be oriented with major principal plane ?

(c) A vertical wall 9 m high retains soil level with the top of the wall. If the soil is a saturated clay with c_u=20 kN/m^2, σ_u=0,