Code No. 6323

FACULTY OF ENGINEERING

B.E. 3/4 (Civil) II – Semester (Main) Examination, May 2014

Subject : Soil Mechanics

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Define : i) Void ratio, ii) Porosity, iii) Degree of saturation
2 State the factors affecting co-efficient of permeability.
3 List out the primary differences between compaction and consolidation.
4 Define Over-Consolidation ratio. What is its maximum value?
5 State the equation that governs the vane shear test and explain the terms involved.
6 "Cohesion increases active earth pressure and decreases passive earth pressure". State yes or no and justify the answer.
7 There is a bed of compressible clay of 4 m thickness with pervious sand on top and impervious rock at the bottom. In a consolidation test on an undisturbed specimen of clay from this deposit 90% settlement was reached in 4 hours. The specimen was 20 mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement.
8 Determine the depth of tension crack developed in a $\phi = 0$ soil having cohesion c = 35 kPa and γ = 18 kN/m^3.
9 Between clay and sand which is more porous and which is more permeable.
10 What is the critical hydraulic gradient for a soil of specific gravity G = 2.7 and void raio e = 0.70?

PART – B (50 Marks)

11 a) Derive the expression $\gamma_{sat} = \left[\frac{G+e}{1+e}\right]\gamma_w$ and hence deduce $e = \left[\frac{G-G_m}{G-S}\right]$ with Standard notations. 5

b) A soil sample has a liquid limit of 20% and plastic limit of 12%. The following data are available from sieve analysis : 5

Sieve size (mm)	% passing
2.000	100
0.425	85
0.075	38

Classify the soil according to IS classification.

12 a) What are the methods used to find out permeability in lab and in field? Explain any one of the methods. 5

b) Determine the neutral and effective stress at a depth of 16 m below the ground level for the following conditions : Water table is 3 m below ground level ; G = 2.68 ; e = 0.72 ; average water content of the soil above water table is 8%. 5

13 a) What are the advantages of compacting soil? Explain in detail the factors affecting soil compaction. 5

b) The wet weight of a sample is missing in a Proctor test. The over-dry weight of this sample is 189 N. The volume of the mould used is 1000 cm^3. If the degree of saturation of this sample is 90%, determine its water content and bulk density. Take G = 2.7. 5

14 a) What is "Relative compaction"? Explain the procedure to determine it? 5

b) The void ratio of clay A decreased from 0.572 to 0.505 under a change in pressure from 120 to 180 kg/m^2. The void ratio of clay B decreased from 0.612 to 0.597 under the same increment of pressure. The thickness of sample A was 1.5 times that of B. Nevertheless the time required for 50% consolidation was three times longer for sample B than for sample A. What is the ratio of coefficient of permeability of A to that of B? 5

15 a) Explain the procedure of the direct shear test. What are its limitations? 6

b) In an unconfined compression test, a sample of sandy clay 8 cm long and 4 cm in diameter fails under a load of 120 N at 10% strain. Compute the shearing resistance, taking into account the effect of change in cross-section of the sample. 4

16 a) Describe Active, Passive and at rest conditions of a backfill and derive expressions for co-efficient of earth pressure for the respective conditions. 6

b) An unconfined aquifer is known to be 32 m thick below the water table. A constant discharge of 2 m^3 / min is pumped out of the aquifer through a tube-well till the water level in the tube-well become steady. Two observation wells at distances of 15 m and 70 m from the tube-well, show fall of 3 m and 0.7 m respectively from their static water levels. Find the permeability of the aquifer. 4

17 a) Explain in detail 'Taylor's stability number'. 4

b) A gravity retaining wall retains 12 m of a backfill, γ = 17.7 kN/m^3 , ϕ = 25° with a uniform horizontal surface. Assume the wall interface to be vertical, determine the magnitude and point of application of the total active pressure. If the water table is at a height of 6m, how far do the magnitude and the point of application of active pressure will change 6

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