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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV5PCGTE **Max Marks: 100**
Course: Geotechnical Engineering - II **Date: 27.02.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Draw neat sketches wherever necessary

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) List the assumptions of Terzaghi's one dimensional consolidation theory **06**

b) Explain the significance of Pre-consolidation pressure. Describe the Casagrande's method of determining it. **06**

c) A saturated clay stratum 5m thick lies above an impervious rock and below a pervious stratum. It has a compression index of 0.25, coefficient of permeability of 3.2×10^{-4} cm/sec, voids ratio at a stress of $150 kN/m^2$ is 1.9. Compute **08**
(i) Change in voids ratio due to increase of stress to $200 kN/m^2$;
(ii) Settlement due to increase in stress and
(iii) Time for 50% consolidation

OR

2 a) Distinguish: Normally consolidated, Over Consolidated and Under Consolidated soils **06**

b) Explain with a neat sketch the principle and methodology of determining coefficient of consolidation by Square root time fitting method **06**

c) A bed of compressible clay 4 m thick has pervious sand on the top and impervious rock at the bottom. In a consolidation test, an undisturbed sample of clay deposit from this site indicated 90% consolidation in 4 hours under one way drainage. The sample was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement **08**

UNIT - II

3 a) Discuss critically the Rankine's and Coulomb's earth pressure theory **06**

b) Describe Culmann's graphical procedure for finding the active earth pressure on a retaining wall with a granular sloping backfill **06**

c) A retaining wall 7.5m high retains two layers of soil. The top soil has $\gamma_1 = 20 kN/m^3$, $\phi_1 = 35^0$. For the lower 3m layer, the values are $\gamma_2 = 18 kN/m^3$, $\phi_2 = 30^0$. Find the magnitude and location of active thrust per meter length of wall. **08**

UNIT - III

4 a) What are the different types of slope failures? Explain with neat sketches **06**

b) Explain with a neat sketch, the procedure for determining Factor of Safety using METHOD OF SLICES for slopes in C-ϕ Soils. **08**

c) An embankment is to be constructed using a soil having has γ=18kN/m^3, ϕ=20^0 and C=20 kN/m^2. Assuming factor of safety against cohesion=1.25 estimate the side slope required. Taylor's stability numbers are as given below. Also find the FS if the slope angle is 1V:2H. **06**

B in degrees	90	75	60	45	30	20	10
Sn	0.182	0.134	0.097	0.062	0.025	0.005	0

UNIT - IV

5 a) Define the following terms:(i) Undisturbed & Disturbed sample; (ii) Area ratio & Inside Clearance **06**

b) Enumerate the objectives of Soil Exploration **06**

c) A seismic refraction study gave the following data. Determine the seismic velocity for the surface and underlying layer. Also find the thickness of upper layer. **08**

Distance from source to geophone in m	15	30	60	90	120
Time to receive waves in Seconds	0.025	0.05	0.10	0.11	0.12

OR

6 a) Distinguish **Boussinesq's** and **Westergaard's** theory of stress distribution **06**

b) Explain construction and uses of Newmark's Chart **06**

c) A point load of 500kN due to a monument acts on the ground surface. Calculate the vertical stress at a point 5m directly below the load and at a distance of 4m from axis of loading. Assume μ=0. Use both Boussinesq's and Westergaard's analysis for estimation of stress **08**

UNIT - V

7 a) Explain: immediate settlement, consolidation settlement, differential settlement and angular distortion **06**

b) Explain the effect of water table on bearing capacity of shallow foundation. **06**

c) A 2mx2m footing located at a depth of 1.5m from ground level in sand. The shear parameters of soil are: C=0 and ϕ=36^0. Determine the ultimate bearing capacity of soil if : (i) water table is at great depth below foundation level (ii) water table at the base of the foundation and (iii) water table rises to GL. Unit weight of soil above W.T. = 18 kN/m^3 and that of saturated soil is 20kN/m^3. Take Nc=50.5, Nq=37.7 and Nγ=48 **08**

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