CBCS SCHEME

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18CV62

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. IS 6403 is permitted.

Module-1

1 a. What are geophysical methods? Explain seismic refraction method with neat sketch. **(08 Marks)**

b. Discuss the necessity of subsoil exploration. Mention the stages involved in it. **(06 Marks)**

c. Determine the area ratio for the following details and state type of sampler. Outer diameter of cutting edge is 80mm, wall thickness is 1.7mm. Comment on the result. **(06 Marks)**

OR

2 a. What is a bore hole log? List the information recorded in it. **(05 Marks)**

b. What is stabilization of bore holes? Explain any two methods. **(08 Marks)**

c. Establish the location of ground water in a clayey stratum. Water in the bore holes has bailed out to a depth of 10.5m below ground surface and the rise of water was recorded at 24 hour interval as follows: $h_1 = 0.63m$, $h_2 = 0.57m$ and $h_3 = 0.51m$. **(07 Marks)**

Module-2

3 a. What is Newmark's influence chart and also describe construction procedure for Newmark's influence chart. **(08 Marks)**

b. Explain the following:
i) Primary consolidation settlement.
ii) Secondary consolidation settlement. **(04 Marks)**

c. A concentrated load of 3000kN acts on the surface of a homogeneous soil mass of large extent. Find the stress intensity at a depth of 10m:
i) Directly under the load
ii) At a horizontal distance 7.5m
Use Boussinesq's equations. **(08 Marks)**

OR

4 a. Explain the terms:
i) Contact pressure
ii) Uniform settlement
iii) Differential settlement
iv) Angular distortion. **(08 Marks)**

b. Explain methods to reduce settlement in buildings. **(06 Marks)**

c. The circular foundation of 18m diameter transmits to the soil a uniform contact pressure of $300kN/m^2$ at a 3m depth. Determine the immediate settlement under the centre of the foundation. Take $E_S = 58MN/m^2$, $\mu = 0.4$, $\gamma = 20kN/m^3$ and influence factor = 1.0 (flexible footing at the centre). **(06 Marks)**

Module-3

5 a. List and enumerate types of failures in finite slopes. **(07 Marks)**

b. Explain the causes for slope failure. **(05 Marks)**

c. A retaining wall with a smooth vertical back is 6m high and retains cohesionless soil with a bulk unit weight of 18kN/m^3 and $\phi = 30°$. The top of the soil is level with the top of the wall horizontal. If the soil surface carries a uniformly distributed load of 5kN/m^2. Determine using Rankine's theory, the total active earth thrust and draw the active earth pressure distribution diagram. **(08 Marks)**

OR

6 a. Explain Swedish circle method of slices of stability analysis for slopes. **(07 Marks)**

b. Define with neat sketches at rest, active and passive earth pressure. **(07 Marks)**

c. An embankment is to be constructed with C = 30kN/m^2, $\phi = 20°$, $\gamma = 18$kN/m^3, factor of safety = 2 and height is 10m. Estimate the required side slope using Taylor's stability number.

Slope angle	90	75	60	45	30	20	10
S_n	0.182	0.134	0.097	0.062	0.025	0.005	0

(06 Marks)

Module-4

7 a. List the advantages and disadvantages of standard penetration test. **(04 Marks)**

b. Explain shallow foundation and its types with a neat sketch. **(08 Marks)**

c. A square foundation is 1.5m × 1.5m in plan corresponding to the friction angle of soil supporting foundation N_c, N_q and N_γ are respectively 17.7, 7.4 and 5.0 and c = 15.5kN/m^2. The unit weight of soil is 17.8kN/m^3. Determine the allowable gross load on the foundation with factor of safety 4. The depth of foundation is 1m and general shear failure occur in soil. **(08 Marks)**

OR

8 a. List the factors affecting bearing capacity of soil in both cohesive and cohesionless soils. **(06 Marks)**

b. Define the following: i) General failure ii) Local shear failure iii) Punching failure. **(06 Marks)**

c. A 2m × 2m footing is located at a depth of 1.5m from ground surface in sand. The shear parameters are C = 0 and $\phi = 36°$. Determine ultimate bearing capacity of soil if

i) Water table is well below the foundation level.

ii) Water table is at base of footing.

iii) Water table is at the ground surface unit weight of soil above water table = 18kN/m^3 and saturated soil is 20kN/m^3. Take $N_c = 50.5$, $N_q = 37.7$, $N_\gamma = 48.0$. **(08 Marks)**

Module-5

9 a. What is negative skin friction? Under what situation it occurs. **(05 Marks)**

b. Explain classification of piles based on function and based on materials. **(08 Marks)**

c. A concrete pile 300mm diameter is driven into a homogeneous consolidated clay deposit $C_U = 40$kN/m^2 and $\alpha = 0.7$. If the embedded length is 10m, calculate the safe load. Take factor a safety = 2.5. **(07 Marks)**

OR

10 a. Explain the determination of single loaded pile capacity for cohesive soil as per IS code by static formula. **(07 Marks)**

b. Write a short note on settlement of piles. **(06 Marks)**

c. A pile is driven in a uniform clay of large depth. The clay has an unconfined compression strength of 80kN/m^2. The pile is 350mm diameter and 7m long. Determine the safe frictional resistance of the pile, assuming a factor of safety of 3. Assume the adhesion factor $\alpha = 0.7$. **(07 Marks)**