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18CV62

Sixth Semester B.E. Degree Examination, June/July 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. Use of IS : 6403 is permitted.

Module-1

1 a. State the objectives of soil exploration programme. **(06 Marks)**

b. With a neat sketch, explain the seismic refraction method. **(06 Marks)**

c. Estimate ground water table, with the following data :
i) Depth upto which water bailed out = 15.0m
ii) Water rise in first day = 0.8m
iii) Water rise in second day = 0.70m
iv) Water rise in third day = 0.60m. **(08 Marks)**

OR

2 a. With a neat sketch, explain auger boring. **(06 Marks)**

b. With a neat sketch of a sampling tube, define :
i) area ratio ii) recovery ratio iii) inside clearance iv) outside clearance. **(06 Marks)**

c. List the methods used for ground water control during excavation. Explain any one of these dewatering systems. **(08 Marks)**

Module-2

3 a. Explain construction and uses of Newmark's chart. **(06 Marks)**

b. A concentrated load of 20kN acts on the surface of a soil mass. Using Boussinesq analysis find vertical stress at points.
i) 3m below axis of loading
ii) At radial distance of 2m from axis of loading but at same depth of 3m. **(06 Marks)**

c. Explain different types of statements of footings. **(08 Marks)**

OR

4 a. List the assumptions made in Boussinesq and Westergaard theories. **(06 Marks)**

b. Explain:
i) Pressure bulb
ii) Pressure distribution on horizontal plane
iii) Pressure distribution on vertical plane. **(06 Marks)**

c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 250kN/m^2 and due to a new building increases the pressure by 120kN/m^2. The liquid limit of the soil is 74%. Water content of soil is 40% specific gravity is 2.67. Estimate consolidation settlement. **(08 Marks)**

Module-3

5 a. Explain Culmann's graphical method of finding out the active earth pressure. **(06 Marks)**

b. What are the causes of failure of slopes? Explain various types of slope failure. **(06 Marks)**

c. A retaining wall, 6m high retains dry sand with an angle of friction of 30° and unit weight of 16.2kN/m^3. Determine the earth pressure of rest. If the water table rises to the top of the wall, determine the increase in the thrust on the wall. Assume submerged unit weight of sand as 10kN/m^3. **(08 Marks)**

OR

6 a. Explain method of slice to determine the factor of safety against failure of finite slope. **(06 Marks)**

b. Explain Rankine's theory for calculating active earth pressure in cohesionless soils for no surcharge. **(06 Marks)**

c. A slope 1 in 2 with a height of 8m has the following soil properties C = 28kN/m^2, ϕ = 10°, γ = 18kN/m^3. Calculate :
i) Factor of safety with respect to cohesion
ii) Critical height of slope
Table of Taylor's stability number to be given for question 6(c).

$\phi \rightarrow$ i $\downarrow$	0°	5°	10°	15°
45°	0.170	0.136	0.108	0.083
30°	0.156	0.110	0.075	0.046
15°	0.145	0.068	0.023	–

(08 Marks)

Module-4

7 a. Define :
i) Ultimate bearing capacity
ii) Net ultimate bearing capacity
iii)Safe bearing capacity. **(06 Marks)**

b. Explain with a neat sketch, general shear failure. **(06 Marks)**

c. A rectangular footing has a size o 1.8m × 3.0m has to transmit the load of a column at a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use is code method. The properties of soil are : n = 40%, G = 2.67, w = 15%, c = 8kN/m^2, ϕ = 32.5°. **(08 Marks)**

OR

8 a. What are the assumptions made in Terzaghi's analysis to find bearing capacity of soils. **(04 Marks)**

b. Explain plate load test with neat sketch to determine bearing capacity of soil. **(08 Marks)**

c. A strip footing 2m wide carries a load intensity of 400kN/m^2 at a depth of 1.2m in sand. The saturated unit weight of sand is 19.5kN/m^3 and unit weight above water table is 16.8kN/m^3. The shear strength parameters are c = 0 and ϕ = 35°. Determine the factor of safety with respect to failure for the following locations of water table : i) water table at 2.5m below ground level ii) Water table is 0.5m below ground level. Take N_q = 41.4 and N_γ = 42.4. **(08 Marks)**

Module-5

9 a. Explain load carrying capacity of pile by i) Dynamic formulae ii) Static formulae. **(10 Marks)**

b. A group of 9 piles, 10m long is used as a foundation for a bridge pier. The piles used are 30cm diameter with centre to centre spacing of 0.9m. The sub soil consists of clay with unconfined compressive strength of 15t/m^2. Determine the efficiency neglecting the bearing action. Given adhesion factor = 0.9. **(10 Marks)**

OR

10 a. With a neat sketch, explain the classification of pile foundation. **(08 Marks)**

b. Explain Negative skin friction. **(08 Marks)**

c. A wooden pile is being driven with a drop hammer weighing 20kN and having a free fall of 1.0m. The penetration in the last blow is 5mm. Determine the load carrying capacity of the pile according to the engineering News formula. **(04 Marks)**

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