CBCS SCHEME

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17CV53

Fifth Semester B.E. Degree Examination, July/August 2022
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. List the various boring methods. Describe with a neat sketch, the wash boring technique for exploration of soil. **(10 Marks)**

b. By conducting a Seismic refraction study, the following readings were obtained.

Time (sec)	0.1	0.2	0.3	0.4	0.45	0.50	0.55
Distance (M)	40	80	120	160	200	240	280

Geophones are placed at a spacing of 40m in a straight line and time takes for the last wave to be received at each geophone is given. What are the velocities of wave in soil layers? What is the thickness of the top stratum? **(10 Marks)**

OR

2 a. Discuss the objectives of dewatering. List the different methods of dewatering and explain any one of them with a neat sketch. **(12 Marks)**

b. Estimate the position of ground water table from the following data :
Depth upto which water is bailed out is 32m. Water rise in the first day : 2 . 4m ,
Second day : 2.0m and third day : 1.6m. **(08 Marks)**

Module-2

3 a. Derive the equation for vertical stress at a depth 'Z' below the point load 'Q' by Boussinesq's analysis. **(06 Marks)**

b. A circular area 6m in diameter carries a uniformly distributed load of 10kN/m^2. Plot the variation of vertical stress at depths 2m , 4m and 8m. **(08 Marks)**

c. Explain Contact Pressure distribution in soils. **(06 Marks)**

OR

4 a. Write a note on Settlement of Footings. **(08 Marks)**

b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 1.5m in sandy soil whose compression index is 10000 kN/m^2. Footing is expected to transmit a unit pressure of 200kN/m^2. Poisson's ratio of soil is 0.3 and influence factor for footing is 1.06. **(04 Marks)**

c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of the clay layer is 300kN/m^2 and load due to new building increases the pressure by 200 kN/m^2. The liquid limit of soil is 75%, natural water content is 50% and G_S = 2.7. Estimate Consolidation Settlement. **(08 Marks)**

Module-3

5 a. List the assumptions made in Rankine's earth pressure theory and explain Active Earth pressure and Passive Earth pressure. **(08 Marks)**

b. For a retaining wall, 8m height supports a sandy backfill with e = 0.6 , G = 2.65 and $\phi = 30°$. Water table is at a depth of 2m from ground surface. Draw Active earth pressure diagram and find magnitude and point of application of total active earth pressure. Assume soil above water table has a degree of saturation of 50%. **(12 Marks)**

OR

6 a. State and explain different types of slopes and list the assumptions made in slope stability analysis. **(08 Marks)**

b. Explain Fellinious method of obtaining centre of critical slip surface in the case of stability analysis of C - ϕ soil. **(06 Marks)**

c. A 5m deep canal has side slopes of 1 : 1, the properties of soil are C = 20kN/m^2 , ϕ = 10° , e = 0.8 and G = 2.8. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion when canal runs full. **(06 Marks)**

Module-4

7 a. Define i) Ultimate bearing capacity ii) Net ultimate bearing capacity iii) Safe bearing capacity iv) Allowable bearing pressure. **(08 Marks)**

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

i) Water table is at the base of footing.

ii) Water table well below the foundation level.

iii) Water table 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_r = 48. **(12 Marks)**

OR

8 a. Explain Plate Load test for determining the ultimate bearing capacity of soil with a neat sketch. **(08 Marks)**

b. A square footing located at a depth of 1.3m below the ground surface has to carry a load of 800kN. Find the required size of footing for the following data : C = 8kN/m^2 , ϕ = 30° , e = 0.55 , degree of saturation = 50% , G = 2.67 , N_c = 37.2 , N_q = 22.5 , N_r = 19.7. Factor of safety is 3. Assume water table is at the base of footing. **(12 Marks)**

Module-5

9 a. Classify the Pile foundations according to function. **(05 Marks)**

b. What is meant by efficiency of pile groups? Discuss Feld's rule for its determination. **(06 Marks)**

c. A 12m long, 30mm diameter pile is driven in uniform deposit of sand with ϕ = 40°. The water table is at great depth. The average dry unit weight of sand is 18kN/m^3. Using N_q = 137, calculate the safe load capacity of single pile with a factor of safety of 2.5 and angle of wall friction = 30° , K = 2. **(09 Marks)**

OR

10 a. Explain Pile Load test, with a neat sketch. **(10 Marks)**

b. Write short notes on :

i) Negative skin friction ii) Under reamed pile foundation. **(10 Marks)**

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