CBCS SCHEME

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15CV53

Fifth Semester B.E. Degree Examination, Aug./Sept.2020
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat sketch of a soil sampler, define i) Area ratio ii) Inside clearance iii) Outside clearance iv) Recovery ratio. **(06 Marks)**

b. Briefly explain wash boring method of making boreholes, with a neat sketch. **(05 Marks)**

c. Discuss the Electrical Resistivity method of soil exploration. **(05 Marks)**

OR

2 a. List the various methods of dewatering during excavations. Explain Electro – Osmotic method of dewatering with a sketch. **(08 Marks)**

b. Estimate the ground water table for the following data. Depth up to which water is bailed out is 18 meters. Water rise on first day = 0.95m , Second day = 0.86m and Third day = 0.78m. Use Hvorselev's method. **(08 Marks)**

Module-2

3 a. Derive the equation for vertical stress below the centre of a circular area with uniform load intensity 'q'. **(08 Marks)**

b. A point load of 500kN acts on the ground surface. Calculate the vertical pressures at a point 5m directly below the load and at a distance of 4m from the axis of loading. Assume $\mu = 0$. Use i) Bousinesq's analysis ii) Westergaard's analysis. **(08 Marks)**

OR

4 a. Explain the components of total settlement. **(06 Marks)**

b. A square footing of sides 2m is founded at a depth of 1.5m below ground level carrying a load of 600kN. The soil below the foundation upto 4m depth is fully saturated clay with $r_{sat} = 20kN/m^3$, Liquid limit = 35% , Natural water content = 15% , G = 2.6. The soil abouve the base of footing is sandy soil with $r = 16kN/m^3$. Calculate the primary consolidation settlement assuming load dispersion at 2V : 1H. **(10 Marks)**

Module-3

5 a. Describe Rehbann's graphical method of determining the active earth pressure on a retaining wall. **(08 Marks)**

b. A vertical smooth wall 6m high retains cohesionless soil with $\phi = 30^0$, G = 2.65 and e = 0.8. Water table is at a depth of 2m from top. A uniform surcharge of $40kN/m^2$ is applied on top of backfill surface. Assume soil above water table is dry. Draw active earth pressure diagram and obtain the magnitude and location of active earth pressure using Rankine's theory. **(08 Marks)**

OR

6 a. Explain the causes for slope failure with sketches. Explain Swedish circle method of slices of stability analysis for slopes. **(10 Marks)**

b. An embankment is inclined at an angle of 35^0 and its height is 15m. The angle of internal friction is 15^0 and the cohesion is $200kN/m^2$. $r = 18kN/m^3$. Find the factor of safety with respect to cohesion , if $S_n = 0.06$. **(06 Marks)**

Module-4

7 a. Explain the types of shear failures with neat sketch. **(06 Marks)**

b. A strip footing 2m wide carries a load intensity of $400kN/m^2$ at a depth of 1.2m in sand. r_{sat} of sand is $19.5kN/m^3$ and r above water table is $16.8kN/m^3$ and $\phi = 35^0$. Using Terzaghi's analysis, determine factor of safety with respect to shear failure for the following locations of water table. Take $N_q = 41.4$, $N_r = 42.4$, $C = 0$.

i) Water table 4m below ground level.

ii) Water table 1.2m below ground level.

iii) Water table at ground level. **(10 Marks)**

OR

8 a. Explain plate load test with neat sketch to determine the bearing capacity of soils. **(08 Marks)**

b. Design a square footing located at a depth of 1.3m below ground level , which carries a safe load of 800kN. The desired factor of safety is 3. Use Terzaghi's analysis for general shear failure. Take $C = 8kN/m^2$, $N_c = 37.2$, $N_q = 22.5$, $N_r = 19.7$, $r = 18kN/m^3$. **(08 Marks)**

Module-5

9 a. Explain the classification of piles based on function and based on materials. **(08 Marks)**

b. A reinforced concrete pile weighing 30kN (inclusive of helmet and dolly) is driven by a drop hammer weighing 40kN and having an effective fall of 0.8m. The average set per blow is 1.4cm. The total temporary elastic compression is 1.8cm. Assuming the coefficient of restitution as 0.25 and a factor of safety of 2, determine the ultimate bearing capacity and the allowable load for the pile. **(08 Marks)**

OR

10 a. Explain the term 'negative skin friction'. **(06 Marks)**

b. In a 16 pile group, the pile diameter is 45cm and centre to centre spacing of the square group is 1.5m. If $C = 50kN/m^2$, determine whether the failure would occur with the pile acting individually or as a group? Neglect bearing at the tip of the pile. All piles are 10m long. Take $m = 0.7$ for shear mobilization around each pile. **(10 Marks)**

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