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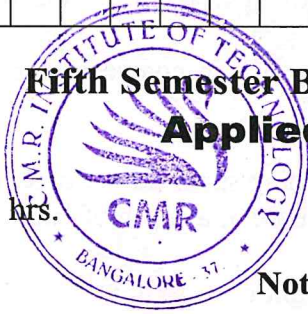
15CV53

Fifth Semester B.E. Degree Examination, July/August 2021
Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Determine the Area ratios for the following soil samplers and comment on the nature of samples obtained using each of the samplers.
   i) Core cutter   165mm   OD   150mm ID
   ii) Split barrel   51mm   OD   35mm ID
   iii) Seamless tube (Shelby)   51mm   OD   48mm ID
   (08 Marks)

   b. What is borehole log? Give a typical bore hole log format. **(05 Marks)**

   c. What are the objectives of dewatering? **(03 Marks)**

2 a. Explain briefly Seismic refraction method of geophysical method of exploration. **(06 Marks)**

   b. With respect to a sampling tube, define i) Area ratio   ii) Inside clearance   iii) Outside clearance   iv) Recovery ratio. **(06 Marks)**

   c. What are the objectives of sub surface exploration? **(04 Marks)**

3 a. Define isobar. Using Boussinesq's equation construct isobar of intensity 0.25Q where Q is point load acting on the surface. **(08 Marks)**

   b. Differentiate between Boussinesq's and Westergaurd's method of determination of stresses in soil. **(04 Marks)**

   c. A circular area of 7.5metre in diameter on the ground surface carries a uniformly distributed load of $3kN/m^2$. Find the intensity of vertical pressure below the centre of the loaded area at a depth of 6m below ground level. **(04 Marks)**

4 a. The base of a tower consists of a equilateral frame, on the corners of which the three legs of the tower is supported. The total weight of the tower is 600kN, which is equally carried by all the three legs. Compute the increment in the vertical stress in the soil caused at a point 5m below one of the legs. **(06 Marks)**

   b. Explain the construction and use of Newmark's chart with a Influence value of 0.005q. **(06 Marks)**

   c. A normally consolidated clay settled by 2cm when the effective stress was increased from 100kPa to 200kPa. Calculate the settlement when the effective stress was increased to 400kPa. **(04 Marks)**

5 a. Explain with relevant diagrams earth pressure at rest, active earth pressure and passive earth pressure on retaining wall. **(06 Marks)**

   b. A retaining wall with a smooth vertical back retains sand backfill for 6m. The backfill has a horizontal surface and has the following properties.
   $c^1 = 0$, $\phi^1 = 28°$, $r = 16kN/m^3$ and $r_{sat} = 20kN/m^3$ water table is at a depth of 3m. Draw the earth pressure diagram. Determine the total active earth pressure on the retaining wall and find its point of application. **(10 Marks)**

6 a. Explain Fellenius method of determination of centre of critical slip circle of failure of slopes. **(06 Marks)**

b. Explain all the steps to determine the active earth pressure in coarse grained soil using Rankine's method. **(10 Marks)**

7 a. Differentiate between general shear, local shear and punching shear failure of soil. **(06 Marks)**

b. A ship footing 1.2m wide, is supported on a soil with its base at a depth of 1m below ground surface. The soil properties are as follows:

$C = 15kN/m^2$, $\phi = 35°$, $r_t = 18kN/m^3$ submerged unit weight $r^1 = 10kN/m^3$

Determine the ultimate bearing capacity if

i) Water table is at great depth.

ii) Water table is at the level of the base of the footing.

iii) The water table is at ground level.

Use Terzaghi's bearing capacity theorem. Bearing capacity factors $N_c = 57.8$, $N_q = 41.4$, $N_r = 42.4$ **(10 Marks)**

8 a. Explain the effect of water table on bearing capacity of soils. **(04 Marks)**

b. How plate load test results are correlated to find bearing capacity and settlement of foundations. **(06 Marks)**

c. A trapezoidal footing is to be proposed to support two square columns of 30cm and 50cm sides respectively. Columns are 6m apart and the safe bearing capacity of soil is $400kN/m^2$. The bigger column carries 5000kN and smaller 3000kN. Design a suitable size of the footing so that it does not extend beyond the faces of the columns. **(06 Marks)**

9 a. Give a brief description of classification of piles based on materials and function. **(10 Marks)**

b. What is negative skin friction in piles? Under what field conditions piles are subjected to negative skin friction. How it is estimated in different soils. **(06 Marks)**

10 a. Explain in detail the determination of load carrying capacity of piles using static formula. **(10 Marks)**

b. Give a brief description of group load carrying capacity of piles. **(06 Marks)**

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