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Total Number of Pages: 02

B.TECH
PCC14401

7th Semester Regular / Back Examination 2015-16

FOUNDATION ENGINEERING

Branch: Civil

Time: 3 Hours

Max marks: 70

Question Code: T186

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Assume suitable data wherever necessary.**

- Q1** Answer the following questions: **(2 x 10)**
- a) Enumerate various types of retaining walls. What is the main thrust on a retaining wall?
 - b) How a retaining wall overturns? Is there any solution for this problem?
 - c) How does punching shear occurs in a foundation? How to prevent it?
 - d) Write down the Brinch-Hansen bearing capacity equation defining each of the terms.
 - e) State and explain Hilley's formula.
 - f) What do you mean by group efficiency of piles in clay? Enumerate various techniques available to estimate this.
 - g) Write a critical note on 'negative skin friction' in piles.
 - h) How do you estimate whether a soil sample collected is disturbed or undisturbed? What is a representative sample?
 - i) Sketch a bore log with some hypothetical data incorporated in it.
 - j) Enumerate various types of joints in a rock mass.
- Q2**
- a) A soil has the following properties: cohesion (c) = 12 kPa, angle of internal friction (ϕ) = 16° ; and unit weight (γ) = 20 kN/m³. Calculate the critical depth of vertical excavation that can be made in the soil without any lateral support. **(5)**
 - b) A retaining wall with a smooth vertical back is 10 m high and retains a two layer sand backfill with following properties: **(5)**

$$0 - 5 \text{ m depth: } c' = 0, \phi' = 34^\circ, \gamma = 20.63 \text{ kN/m}^3$$

$$\text{Below 5 m depth: } c' = 0, \phi' = 31^\circ, \gamma = 21.54 \text{ kN/m}^3$$

Show the active earth pressure distribution assuming that the water table is at 5 m below the top of the retaining wall. Assume that the top of the backfill is horizontal.

- Q3** a) Design a strip footing to carry a load of 1050 kN/m at a depth of 2 m in a c- ϕ soil having a unit weight of 19.78 kN/m³ and shear strength parameters; cohesion (c) as 18 kN/m² and angle of internal friction (ϕ) as 25°. Determine the width of footing, using a factor of safety of 3 against shear failure. Use Terzaghi's analysis. **(5)**
- For $\phi = 25^\circ$, take $N_c = 25.1$, $N_q = 12.7$ and $N_\gamma = 9.7$.
- b) Discuss a plate load test. How do you estimate the SBC of a soil from this test? **(5)**
- Q4** (a) Discuss the use of Dutch cone penetration test to obtain the bearing capacity of a soil. **(5)**
- (b) Discuss when and where mat foundations are preferred over other types of foundations. Is it economical? **(5)**
- Q5** a) What is a pile foundation? When and where is it recommended? If the bedrock is encountered at a great depth, can you suggest the pile foundation? What is a friction pile? How does it differ from compaction piles? **(5)**
- b) Discuss the use of various static formulae to estimate the bearing capacity of piles on both cohesive and cohesion-less soils. **(5)**
- Q6** a) Sketch a well foundation showing all its component parts. How do you estimate the depth and bearing capacity of a well foundation? **(5)**
- b) Discuss the electrical resistivity method geophysical exploration. **(5)**
- Q7** a) How an undisturbed sample is obtained and preserved? Discuss any one procedure for obtaining undisturbed samples for a Railway project. **(5)**
- b) What are various penetration tests useful for sub-soil exploration? Explain and discuss various factors that help decide the number and depth of bore holes required for subsoil exploration. **(5)**
- Q8** Write brief notes on **any five** **(2 x 5)**
- Earth pressure when retaining wall moves towards the backfill.
 - Effect of water table on bearing capacity of soil
 - Dolphins
 - Vesic's bearing capacity equation
 - Rebhan's graphical solution when $\beta = \phi$
 - Piston sampler
 - RQD
 - Bedding plane
 - Fissures and faults in rock