**[5460]-108**

**T.E. (Civil)**

**FOUNDATION ENGINEERING**

**(2012 Pattern) (301009) (End Sem.)**

*Time : 2½ Hours]*                                                    *[Max. Marks : 70*

*Instructions to the candidates:*

  *1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12.*

  *2) Neat diagrams must be drawn whenever necessary.*

  *3) Figures to the right indicate full marks.*

  *4) Assume suitable data, if necessary and mention it clearly.*

  *5) Use of non-programmable calculator is allowed.*

## SECTION - I

*Q1)* Discuss Seismic refraction method of soil exploration in accordance with:**[7]**

  a)    Principle

  b)    Procedure and sketch

  c)    Limitation

### OR

*Q2)* a)    Differentiate between SPT and DCPT.                          **[3]**

  b)    Discuss factors affecting sample disturbance.                  **[4]**

*Q3)* a)    Explain the modifications suggested by Mayerhoff in the Terzaghi's bearing capacity equation.                                        **[3]**

  b)    Discuss how to determine bearing capacity of the layered soil.   **[3]**

### OR

*Q4)* A strip footing 1m wide, with the base located at the depth of 1m below ground surface. Soil properties are $\gamma = 18.5$ kN/m$^3$, $c = 3.0$ kN/m$^2$ and $\phi = 20°$. Determine safe bearing capacity using F.S. = 3. Assume soil fails by local shear, for $\phi = 20°$, $N_c = 11.8$, $N_q' = 3.9$ and $N_\gamma' = 1.7$. Use Terzaghi's analysis.                                                      **[6]**

*P.T.O.*

*Q5)* Explain the terms: **[7]**
 a) Compression index.
 b) Over consolidation ratio
 c) Allowable settlement
 d) Consolidation settlement

OR

*Q6)* The consolidation test is conducted on the soil with following properties, compression index 0.25, void ratio at the stress of 10 kN/m$^2$ is 2.02, and coefficient of permeability is $3.4 \times 10^{-7}$ mm/sec. Determine. **[7]**
 a) Change in void ratio if stress is increased by 9 kN/m$^2$.
 b) Settlement if soil is 4m thick.
 c) Time required for 40% consolidation for one way drainage. $(T_v) = 0.125664$.

## SECTION - II

*Q7)* a) Enlist the methods of determining pile capacity. Explain any two methods.**[6]**
 b) Sketch a sectional elevation of well foundation. Explain the function of each part. **[6]**
 c) Explain in detail negative skin friction on piles. **[4]**

OR

*Q8)* a) Find out group capacity of piles by any of following three methods. **[8]**
 i) Fled's rule
 ii) Block Failure
 iii) Converse Labbare's Formula
 iv) Individual
 Pile group consisting of 15 piles arranged in 3 rows, diameter of pile is 300 mm, depth of pile 8m, c = 25kN/m$^2$, Spacing of pile = 0.8 m c/c. $\alpha$ = 1.0, Unit weight of soil = 10 KN/m$^3$.
 b) Explain with figures the following difficulties and their rectification. **[8]**
 i) Tilt
 ii) Hanging up
 iii) Sand blow

*Q9)* a) Explain the terms with sketches. **[6]**
 i) Free earth support
 ii) Fixed earth support in connection with anchored sheet piles for their bending moment.
 b) Explain merits and demerits of Circular type, Diaphragm type cellular cofferdams. **[6]**
 c) What are the various ground improvement techniques? Explain any one of them. **[4]**

OR

*Q10)* a) Discuss the factors affecting selection of type of Cofferdam and explain the suitability of various types of cofferdams. **[6]**

b) What is swelling potential of soil and what are the methods for determination of swelling potential of black cotton soil. **[6]**

c) A sheet pile has following details: **[4]**

   i) Embedment depth –5m

   ii) Cantilever height 4m

   iii) $\phi = 30^0$ determine factor of safety against overturning.

*Q11)* a) What is liquefaction? Explain the liquefaction susceptibility criteria. **[6]**

b) Explain the use of geosynthetics in

   i. Retaining wall

   ii. Deep foundation

   iii. Embankments on soft soils. **[6]**

c) What is reinforced earth wall? Explain with neat sketch. **[6]**

OR

*Q12)* a) Define the following terminologies correlated with earthquake. **[6]**

   i) Epicenter

   ii) Focus

   iii) Focal depth

   iv) Epicentral distance

   v) Foreshocks and aftershocks

   vi) Body waves

b) What is geosynthetics? Enlist the advantages of geosynthetics materials for reinforcement and What are its functional requirements? **[6]**

c) Enlist and explain different types of seismic waves. **[6]**

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